Chemistry & Materials Science DIRECTORATE

Facts & Figures 2004

Supplement to the CMS Annual Report

UCRL-AR-129465-04

Lawrence Livermore National Laboratory

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NNSA
National Nuclear Security Administration

Available electronically at http://www-cms.llnl.gov/facts_figures_04.pdf

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April 2004
UCRL-AR-129465-04

Chemistry and Materials Science Directorate

Facts & Figures

2004

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Message from Tomás Díaz de la Rubia

As the Associate Director for Chemistry and Materials Science (CMS), I welcome new readers and long-time readers to this publication. *Facts & Figures* has evolved over the years to keep pace with the growth of CMS. The title of this publication reflects its origins and intent to be a broad overview of budgetary, personnel, and other administrative information about Lawrence Livermore National Laboratory (LLNL) and our directorate.

This year we expanded *Facts & Figures*, providing more analysis and interpretation of CMS operations. This publication is a companion and supplement to our science and technology annual report.

The Laboratory is 52 years old, and since it's inception, Chemistry, as a discipline, has been identified as a separate organization. I am proud to be a part of a dyanmic team and look forward to a very exciting but challenging 2004. It is our tradition of excellence in meeting the demands of the Laboratory and in anticipating its future needs through innovations in science and technology that position us to be an essential part of meeting the challenges and opportunities of the future. We are poised for collective success.

Regards,
Tomás

2003 at a Glance

The Laboratory Workforce
6,961 career employees, 964 term appointments, 145 postdoctoral researchers, 776 noncareer employees, and 554 other non-LLNL laborers.

Laboratory Organization
Director; Deputy Director Science and Technology; Laboratory Executive Officer; Deputy Director Operations; Defense and Nuclear Technologies (DNT); National Ignition Facility (NIF) Programs; Nonproliferation, Arms Control, and International Security (NAI); Homeland Security; Energy and Environment (E&E); Physics and Advanced Technologies (PAT); Biology and Biotechnology Research Program (BBRP); CMS; Engineering; Computation; Safety and Environmental Protection (SEP); Administration and Human Resources (AHRD); and Laboratory Services.

Laboratory Operating Costs
$1.286 billion

Laboratory Full-Time Equivalents
7,870

Chemistry and Materials Science Workforce
358 career employees, 75 term appointments, 37 postdoctoral researchers, 65 noncareer employees, and 16 other non-LLNL laborers

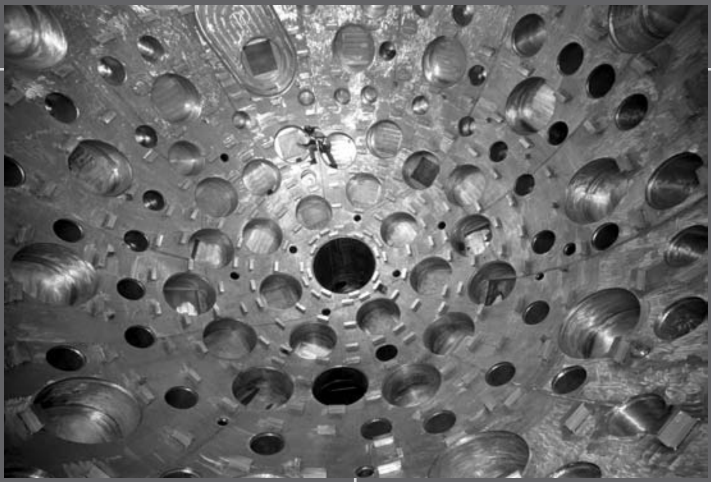
CMS Organization
Associate Director (AD); Principal Deputy AD; Deputy AD for Planning, Development, and Personnel; Chief Scientist; Chief Technologist; Assurance Manager; Operations Managers; Chemical Biology and Nuclear Science Division Leader; Chemistry and Chemical Engineering Division Leader; Materials Science and Technology Division Leader; Material Program Leaders for DNT, NIF, and NAI; Seaborg Institute for Transactinium Science; BioSecurity and Nanosciences Laboratory; and Forensic Science Center.

CMS Operating Costs
$55.1 million

CMS Full-Time Equivalents
420

Chemistry and Materials Science Facts & Figures

Lawrence Livermore National Laboratory



From top left: CMS provided the project management for LLNL's new 16,000-square-foot Central Café. Top right: Inside NIF's 10-meter-diameter target chamber. Bottom left to right: Aerial photograph of the Livermore site. Next: LLNL has developed a portable gas chromatograph–mass spectrometer capable of analyzing low-concentrations of chemical weapons agents and identifying potentially lethal compounds and their surrogates. Next: CMS staff, working with industrial partners, pioneered a continuous melting and pouring process for phosphate laser glass to meet the needs of the NIF laser. Bottom right: LLNL's new Terascale Computing Facility under construction. CMS will use the computers to be housed there for theory, simulation, and modeling projects.

Facts and Figures—Lawrence Livermore National Laboratory

History

Lawrence Livermore National Laboratory is a U.S. Department of Energy (DOE) national laboratory operated by the University of California. LLNL was founded in September 1952 as a second nuclear weapons design laboratory to promote innovation in the design of our nation's nuclear stockpile through creative science and engineering. Livermore has also become one of the world's premier scientific centers, where cutting-edge science and engineering in the interest of national security is used to break new ground in other areas of national importance, including energy, biomedicine, and environmental science.

The single event that triggered the establishment of LLNL was the detonation of the first Russian atomic bomb in 1949. Some American scientists were alarmed that the Soviets could advance quickly to the next step, the hydrogen bomb, with potential disaster for the West. Ernest Lawrence was a key participant in the World War II atomic bomb project at Los Alamos, a Nobel laureate, and founder of the University of California (UC) Radiation Laboratory at Berkeley. Edward Teller was a brilliant physicist at the Los Alamos nuclear weapons laboratory. They met in October of 1949 to discuss the Russian threat.

It was essential, Teller came to believe in the course of the next several years, to start a second nuclear weapons laboratory—to provide competition, to diversify expertise, and to handle the large volume of work that future fast-breaking discoveries would bring. Lawrence supported Teller's proposal for a second weapons lab, and he wanted it established at Livermore. Moreover, he wanted Teller to oversee setting up the new laboratory.

Teller presented his case to Atomic Energy Commission Chairman Gordon Dean on April 4, 1951, in Washington, D.C. In July 1952, formal Atomic Energy Commission action created the Livermore branch of the UC Radiation Laboratory. In September, this second weapons laboratory opened its doors at the site of a former naval air station, in the sleepy cow town of Livermore, California. Among the group of young Berkeley scientists who were working with Lawrence was 32-year-old Herbert York. Barely three years out of graduate school, York was singled out by Lawrence to head the new laboratory.

York set out to develop the Laboratory's program and created four main elements: Project Sherwood (the Magnetic Fusion Program), diagnostic weapon experiments (both for Los Alamos and Lawrence Livermore), the design of thermonuclear weapons, and a basic physics program. The first two facilities were a building to house the latest electronic computer, a Univac, and a technology building with a large central bay for lifting heavy equipment.

In the early days, Lawrence Livermore's focus was on national needs and technical opportunities. Experts in chemistry, physics, and engineering had a common understanding of the Laboratory's mission and developed new technologies on their own. But along with this went a team effort to understand problems and to work them out together.

Over the following five decades, this new facility was destined to be a competitor of Los Alamos in the development of U.S. nuclear deterrents. Lawrence Livermore was also to become one of the world's premier scientific centers, using its knowledge of nuclear science and engineering to break new ground in energy, computations, biomedicine, and environmental science.

Mission

LLNL is a premier applied-science, national-security laboratory. Its primary mission is to ensure that the nation's nuclear weapons remain safe, secure, and reliable and to prevent the spread and use of nuclear weapons worldwide.

This mission enables Laboratory programs in advanced defense technologies, energy, environment, biosciences, and basic science to apply Livermore's unique capabilities and to enhance the competencies needed for the national-security mission.

The Laboratory serves as a resource to the U.S. Government and as a partner with industry and academia.

Vision and Goals

The Laboratory's goal is to apply the best science and technology (S&T) to enhance the security and well-being of the nation and to make the world a safer place.

Organization

No standardized organizational structure exists within the program and support directorates. Each directorate is organized by its AD to efficiently meet the needs and mission of the Laboratory (see Figure 1).

Figure 1. LLNL Organization Chart

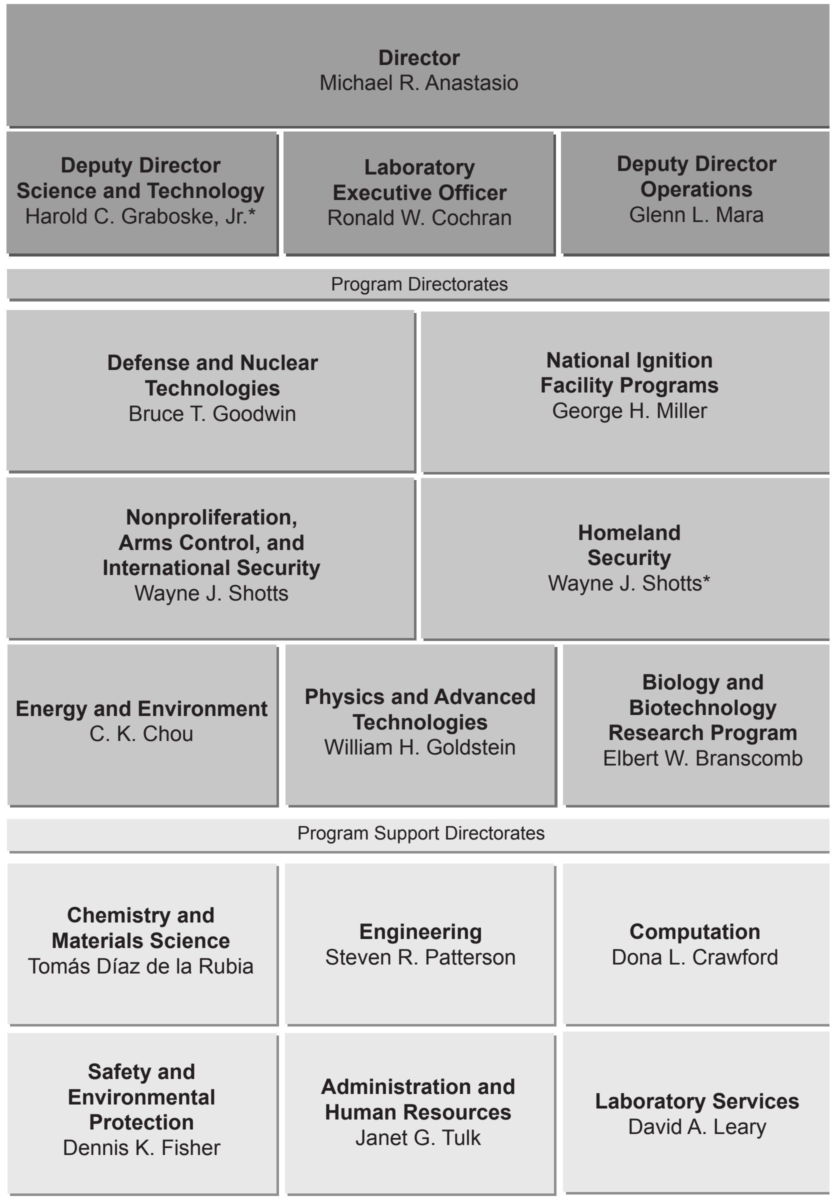


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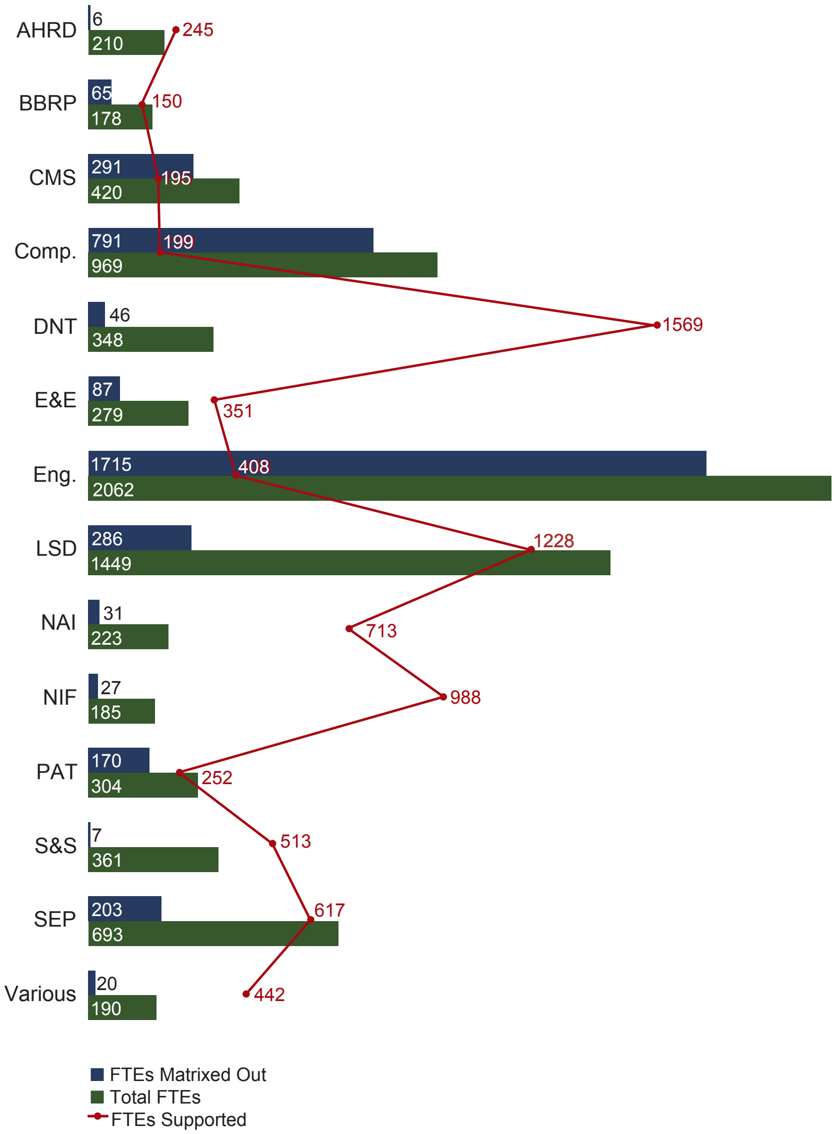
Figure 2. LLNL Organization Matrix



Operations

Laboratory programs are supported by a large technical base consisting of more than 1200 PhD scientists and engineers. A significant portion of the scientific staff is organized into "disciplines" or support directorates—CMS, Computation, and Engineering—and many of these people are matrixed, or assigned, to specific programs within other directorates. Use of the matrix system fosters the efficient transfer of technical knowledge among programs, enables staff members to develop a wide-ranging set of skills and knowledge, and infuses projects with diverse ideas for solutions. As a result, the Laboratory has the ability to seize program opportunities, the agility to react quickly to technical surprises, and the flexibility to respond to programmatic changes. Figure 2 and Table 1 show the total number of full-time equivalents (FTEs) and the mix of FTEs supported by each organization as well as the percentages of Laboratory employees matrixed out to different directorates. FTE is a term used to describe a full-time employee who, during the course of a year, takes an average amount of vacation, sick leave, and other leave in addition to normal holiday leave. (See Acronyms and Abbreviations on page 39 for full organizational names.)

Table 1. Percentage and Number of Matrixed Employees

	Percent Matrixed Out	AHRD	BBRP	CMS	Comp.	DNT	E&E	Eng.	LSD	NAI	NIF	PAT	S&S	SEP	Various	FTEs Supported	FTEs Matrixed In
AHRD	3%	203.7	0.3	0.9	8.0	-	2.0	9.3	12.2	0.8	2.7	1.2	-	1.6	1.1	245	42
BBRP	36%	1.0	114.0	1.4	20.3	0.1	1.1	3.5	2.9	0.1	-	1.0	0.1	4.5	1.0	150	37
CMS	69%	-	0.9	129.6	18.9	-	0.6	16.5	3.1	1.2	2.1	1.8	-	19.2	0.2	195	66
Comp.	82%	-	-	-	177.3	-	0.6	10.1	9.7	-	-	0.1	-	1.6	0.1	199	22
DNT	13%	0.9	-	128.8	289.8	303.4	19.2	622.2	39.1	13.5	1.5	94.9	1.9	54.9	-	1,569	1,267
E&E	31%	-	2.4	32.4	57.1	0.1	192.4	48.2	6.2	0.2	0.4	1.0	0.3	10.5	-	351	159
Eng.	83%	0.1	1.8	2.8	27.5	0.2	0.5	348.5	11.5	-	0.1	1.4	0.2	13.2	-	408	60
LSD	20%	0.1	0.1	2.2	18.3	-	0.5	10.1	1,163.6	-	0.4	-	1.7	30.6	0.3	1,228	65
NAI	14%	-	38.5	44.9	118.6	9.4	38.4	201.0	17.9	193.1	0.2	29.0	1.4	22.8	0.3	713	521
NIF	14%	-	-	37.7	93.8	16.1	-	540.5	73.7	0.7	158.6	15.3	0.1	20.2	0.4	988	829
PAT	56%	-	0.3	5.5	16.0	3.2	0.4	77.7	2.3	-	1.5	136.0	0.1	8.5	0.1	252	117
S&S	2%	0.3	-	1.0	68.2	12.6	0.7	50.6	20.3	0.1	0.2	0.2	352.9	7.5	-	513	160
SEP	29%	1.7	0.4	13.5	32.2	0.6	4.9	36.6	32.7	0.1	1.8	0.3	1.3	490.2	0.1	617	128
Various	10%	1.4	18.4	18.8	22.1	2.5	18.3	57.0	52.4	13.5	15.2	24.9	0.2	7.4	186.0	442	272
Totals		209	177	420	969	348	280	2,062	1,448	223	185	307	360	693	190	7,767	3,639

Minor variance may occur due to rounding.
September 30, 2003

Financial and Full-Time-Equivalent Highlights

LLNL's operating and capital expenses totaled $1,594 million for the fiscal year (FY) ending on September 30, 2003. This included $1,286 million for Laboratory operating budgets and $307.9 million for capital projects. FY04 operating and capital budgets are projected to be $1,632 million. The Laboratory's institutional and distributed costs in FY03 totaled $791.3 million. The staffing level as of September 30, 2003, was 7,870 FTEs, including full-time, part-time, and indeterminate-time employees. As of November 30, 2003, there are 7,828 planned FTEs. (See Table 2 for the breakdown of financial and FTE information by major program.) Part-time employees are counted as fractional FTEs; therefore, FTE totals are not equivalent to the number of employees.

Figures 3 and 4 show the operating costs and FTEs from FY99 to FY03.

Staffing and Demographics

As of September 30, 2003, the LLNL workforce numbered 9,400. This workforce is composed of 74% career employees, 10% term appointments, 2% postdoctoral researchers, 8% noncareer employees (including temporary, student, faculty, retiree, and miscellaneous employees), and 8% supplemental laborers (see Figure 5 and Table 3). According to the staff profile of indefinite employees, 39% are scientific staff, 22% are administrative and clerical personnel, and 39% are technical and crafts personnel. About 44% of the scientists and engineers have PhDs. For a listing of staff by degree composition and job title, see Figure 6 and Table 4.

Table 2. Laboratory Costs and FTEs by Major Program

	FY03 Actual 9/30/03		FY04 Planned as of 11/30/03	
Major Program	$M	FTEs	$M	FTEs
Operating Costs				
Stockpile Stewardship and Management	444.8	1,256	**474.2**	**1,268**
Advanced Simulation and Computing Platforms and Alliances II	72.3	-	**138.2**	**-**
Facilities and Infrastructure	10.3	3	**10.5**	**2**
Inertial Confinement Fusion (ICF)	38.2	101	**46.1**	**109**
Experimental Support Technology	17.7	60	**18.3**	**60**
NIF Demonstration	74.5	247	**96.0**	**329**
NIF Project	1.2	5	**1.5**	**4**
S&S	80.4	504	**83.4**	**528**
NAI	93.0	176	**76.1**	**138**
Other National Nuclear Security Administration (NNSA)	1.7	-	**1.5**	**-**
DOE Direct	139.5	446	**142.4**	**462**
Homeland Security	33.4	83	**64.9**	**158**
Work for DOE/Integrated Contractor	100.8	245	**94.8**	**230**
Non-DOE	175.9	392	**186.2**	**427**
Net Year-End Account Adjustment	2.5	-	**-**	**-**
Total Sponsor-Funded Operating Costs	1,286.2	3,518	**1,434.1**	**3,715**
Capital Costs				
NNSA Construction	306.7	432	**192.8**	**214**
DOE Construction	1.2	-	**5.1**	**1**
Total Sponsor-Funded Capital Costs	307.9	432	**197.9**	**215**
Total Sponsor-Funded Operating and Capital Costs	1,594.2	3,950	1,632.0	3,930
Distributed Costs				
Laboratory-Directed Research and Development	65.7	264	**65.0**	**261**
Plant Engineering Jobs	-	549	**-**	**516**
Distributed Service Center	149.4	420	**161.7**	**471**
Organization Facility Charge	99.2	305	**102.7**	**309**
Organization Personnel Charge	115.0	681	**115.5**	**670**
Program Management Charge	64.6	373	**65.0**	**361**
Institutional General Purpose Equipment	11.5	8	**4.4**	**5**
General and Administration	286.0	1,321	**269.8**	**1,305**
Total Distributed Costs	791.3	3,920	**784.1**	**3,897**
Total Operating, Capital, and Distributed Costs	2,385.5	7,870	**2,416.0**	**7,828**

Minor variances may occur due to rounding.
$M = millions of dollars

Figure 3. Laboratory Operating Costs during the Past Five Years

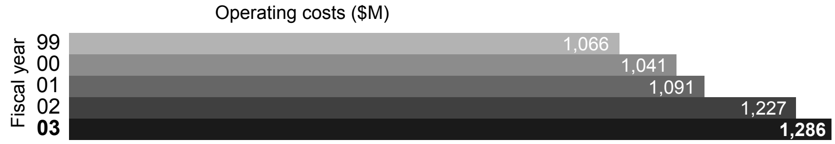


Figure 4. Number of Laboratory FTEs during the Past Five Years

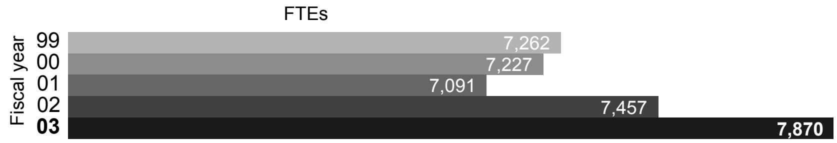


Figure 5. Five-Year Population Distribution by Workforce Status

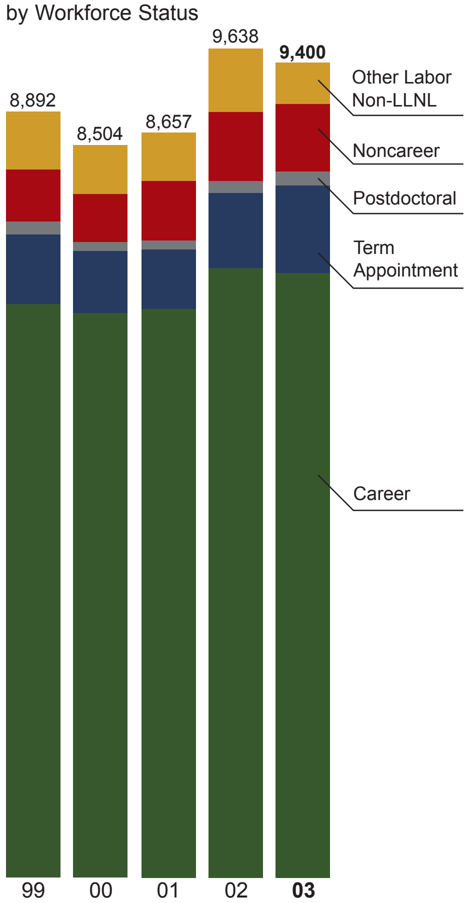


Table 3. LLNL Workforce

Workforce Category	FY99	FY00	FY01	FY02	**FY03**
Career employees	6,668	6,488	6,613	7,081	**6,961**
Term appointments	808	788	687	874	**964**
Postdoctoral researchers	144	104	103	142	**145**
Noncareer employees	608	565	687	796	**776**
Other labor (non-LLNL)	664	559	567	745	**554**
Total Laboratory Workforce	8,892	8,504	8,657	9,638	**9,400**

Figure 6. LLNL Staff Profile by Degree Composition

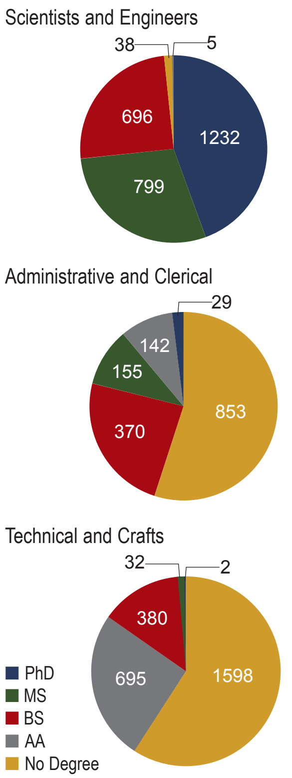
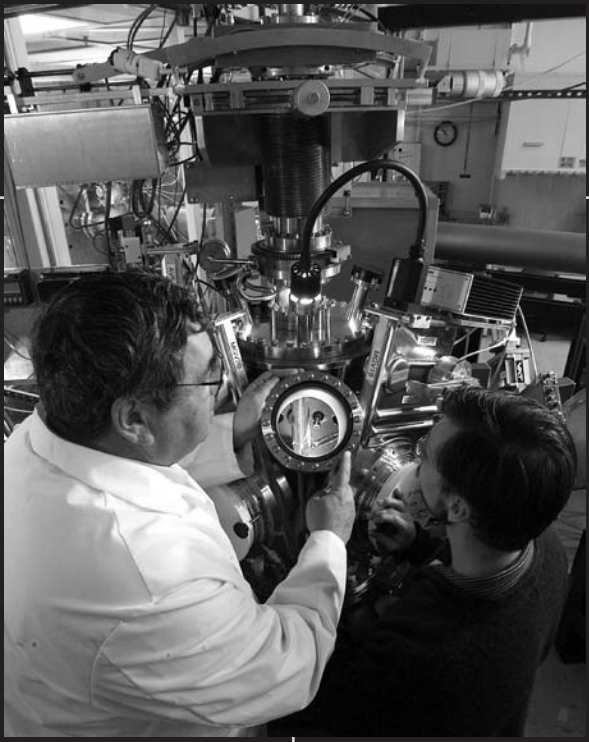


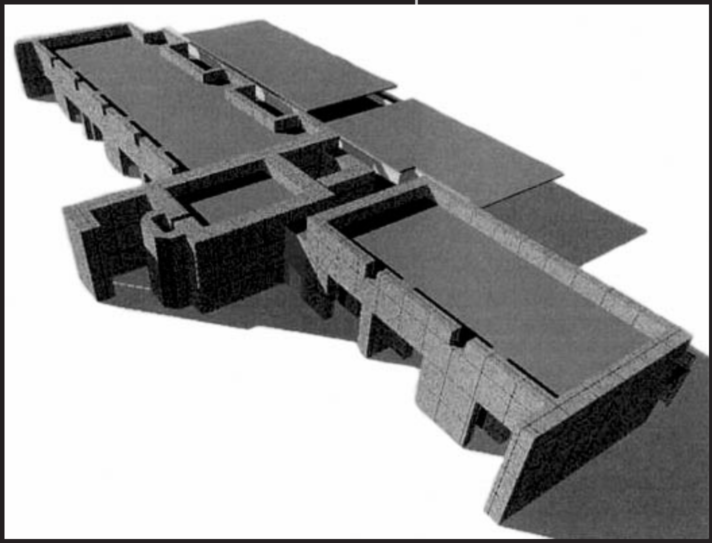
Table 4. LLNL Staff Profile by Job Title and Degree Composition

Job Title	PhD	MS	BS	AA	No	Total	Staff%
Scientists and Engineers							
Physicists (270)	646	79	27	-	2	754	11%
Chemists (242)	140	37	43	-	1	221	3%
Engineers/Patent Engineers (168, 249)	269	404	266	2	14	955	14%
Mathematicians/Computer Scientists (256, 285)	99	212	300	2	21	634	9%
Biological Scientists (225, 277, 235, 228, 221)	19	17	24	-	-	60	1%
Environmental Scientists (230)	16	36	31	-	-	83	1%
Metallurgists (265)	32	7	2	1	-	42	1%
Staff Medical Doctors (MDs) (263)	4	-	-	-	-	4	0%
Political Scientists (295)	7	7	3	-	-	17	0%
Total Scientists and Engineers	1,232	799	696	5	38	2,770	39%
Administrative and Clerical							
Management (196, 197)	17	57	41	4	15	134	2%
Professional (163–165, 169, 170)	4	22	35	1	5	67	1%
Administrative (100–162)	8	76	236	70	320	710	10%
Clerical/General Services (400–462)	-	-	58	67	513	638	9%
Total Administrative and Clerical	29	155	370	142	853	1,549	22%
Technical and Crafts							
Security/Fire Department (051, 055, 650–656)	-	1	32	53	226	312	4%
Technical (302–339, 393, 347–391, 502–588, 593)	2	31	333	583	982	1,931	28%
Trades (722–799, 805–990)	-	-	15	59	387	461	7%
Facilities/OJT/General Helper (700, 701, 704, 801)	-	-	-	-	3	3	0%
Total Technical and Crafts	2	32	380	695	1,598	2,707	39%
Total Laboratory Staff	1,263	986	1,446	842	2,489	7,026	100%
Degree Composition Percent	18%	14%	21%	12%	35%	100%	

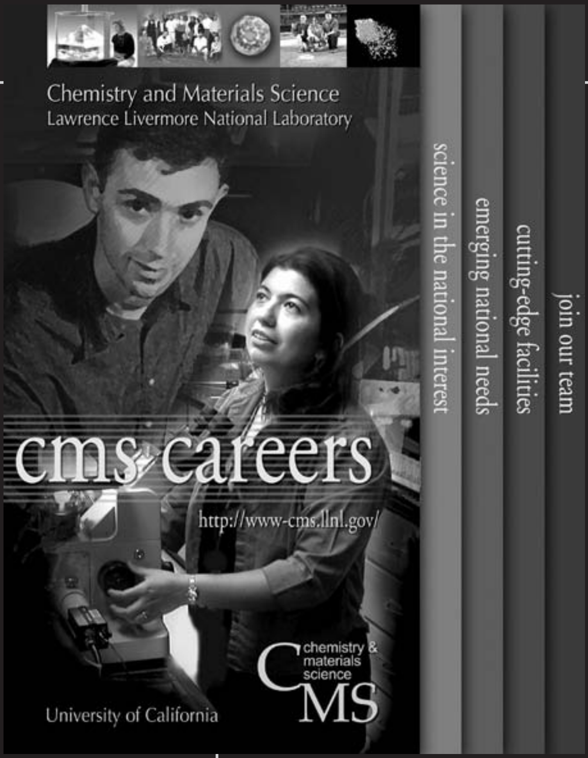
Excludes summer hires, temporary program participants, and postdoctoral. Numbers in parenthesis are the job classifications.
OJT = on-the-job training

Chemistry and Materials Science Facts & Figures





Chemistry and Materials Science



From top left: Synthetic chemist Julie Perkins works to link two molecules. The new molecule will bind more strongly and securely to a specific toxin protein than the individual molecules can. Top middle: Researchers Mike Fluss and Brian Wirth measure the atomic transport properties of radiation damage defects in metals, including plutonium. Top right: CMS' Recruiting Brochure describes how prospective employees can achieve their career goals while pursuing science in the national interest at LLNL. Bottom left to right: Scientists at the Forensic Science Center demonstrate Livermore's solid-phase microextraction sampling technique for identifying and quantifying the chemical composition of physical evidence. Next: Conceptual design of CMS' Energetic Materials Processing Center at Site 300. Next: Laura Seeley watches crystal growth. Bottom right: CMS team removes potentially contaminated material and equipment from a fume hood in Building 241.

Facts and Figures—Chemistry and Materials Science

History

Since LLNL's inception in 1952, Chemistry, as a discipline, has been identified as a separate organization. It has been called the Chemistry Group, the Chemistry Division, the Chemistry Department, the Chemistry and Materials Science Department, and since 1985, the Chemistry and Materials Science Directorate. Table 5 outlines the major changes in the Chemistry organization since 1952.

Operations

The scientific and technical discipline activities of the CMS Directorate can be divided into three broad categories:

1. CMS staff assigned to work directly in a program—a matrix assignment typically involving short deadlines and critical time schedules.
2. The development, management, and delivery of analytical, characterization, measurement, synthesis, processing, and computing capabilities and scientific services to the programs.
3. Longer-term research and development (R&D) activities in technologies important to the programs, determining the focus and direction of technology-based work on programmatic needs.

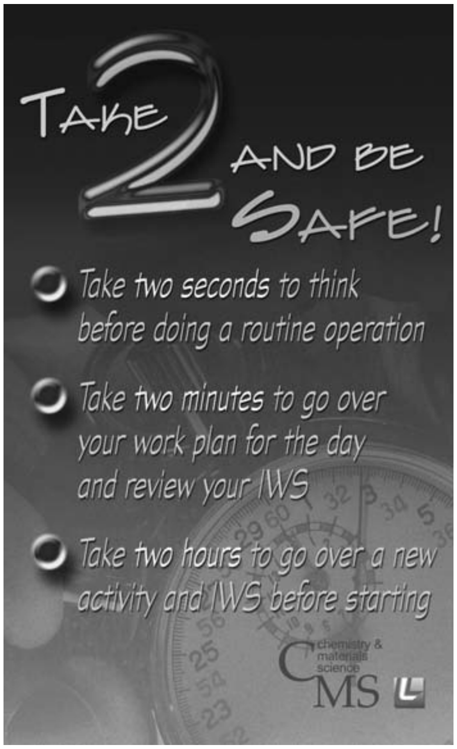
Table 5. Chronological History of CMS Directorate Management from 1952 to the Present

Year	CMS Directorate Management
1952	The Chemistry Group—50 of the Laboratory's 308 full-time equivalents—reports to E. O. Lawrence through Herb York. Ken Street, Chemistry Department Head.
1953	Roger Batzel, Assistant Department Head of Chemistry.
1956	Ken Street, Chemistry Division Leader.
1957	Ken Street, AD of Chemistry.
1959	Ken Street goes to UC Berkeley (he returns to Livermore in 1974 as the Energy Programs AD). The Chemistry Division, under Roger Batzel, reports to Edward Teller.
1961	Roger Batzel, Chemistry AD and acting AD for the Test Directorate (remains Department Head).
1966	Roger Batzel, Chemistry and Space Reactor Program AD.
1967	Gus Dorough, Chemistry Department Head.
1969	Roger Batzel, Chemistry and Biomedical Research AD.
1971	Roger Batzel, LLNL Director. James Kane, Chemistry Department Head.
1973	Gus Dorough, AD for Scientific Support (which included Chemistry and Computation). The Chemistry Department becomes the Chemistry and Materials Science Department.
1974	James Kane goes to Washington as Technical Assistant to the General Manager, Atomic Energy Commission. (He later became the head of Energy Research. In 1985, Kane was appointed as the Special Assistant for Laboratory Affairs, UC Office of the President, under Senior Vice-President Bill Frazer.) Jack Frazer, Chemistry Department Head.
1977	The Radiochemistry Division moves to the Nuclear Test Directorate and is renamed the Nuclear Chemistry Division under Chris Gatrousis.
1978	Charles Bender, Chemistry Department Head.
1982	Ken Street, Acting AD for Chemistry and Computation.
1983	Computation separates from Chemistry, with Bob Borchers as the Computation AD.
1985	Chris Gatrousis, AD for CMS.
1994	Jeff Wadsworth, AD for CMS. The Nuclear Chemistry Division rejoins the CMS Directorate.
1996	Larry Newkirk, Acting AD for CMS.
1997	Hal Graboske, AD for CMS.
2002	Tomás Díaz de la Rubia, AD for CMS.

Integrated Safety Management System

CMS applies Livermore's Integrated Safety Management System (ISMS) to incorporate quality assurance and environment, safety, and health (ES&H) requirements into CMS research and work activities. The focus of CMS ISMS is to provide resources to our scientists and employees to support the accomplishment of research or work activities in ways that fulfill the ES&H requirement to do work safely.

To achieve ISMS goals, CMS provides safety officers and ES&H Team 5 as support to our researchers. These resources help researchers complete the Integration Work Sheet process to identify ES&H requirements early in their work planning. This process results in improved project planning and, ultimately, fewer ES&H roadblocks and better budget estimates.



CMS' goal is zero injuries.

Another strong component of CMS ISMS is our facility safety committees, which operate in each CMS-managed facility. These committees enable workers to assist in resolving safety issues that affect research and work activities in the CMS Directorate's facilities.

While we continue to seek feedback for continuous improvement, our ISMS has helped us to better define line management's responsibility for work activities and has increased worker involvement in and awareness of safety.

Mission

The mission of the CMS Directorate is to enable the Laboratory to accomplish its primary missions through excellence in the chemical and materials sciences.

Vision

The CMS Directorate's vision is to be known as the premier provider of scientific leadership that anticipates and meets the needs of Laboratory programs, is recognized as a national leader in the chemical and materials sciences, and has an exceptional and safe work environment that attracts and retains a vital and diverse workforce.

Strategic Goals

The CMS Directorate's strategic goals are:

- Delivering on our commitments and enhancing our intellectual leadership in key areas of the Laboratory
- Excelling in science that ensures program success in responding to national missions
- Performing science and technology of nationally recognized excellence
- Developing and maintaining a high-quality diverse workforce that serves the needs of the Laboratory

Organization

Figure 7 shows the current CMS organization, which includes the leaders of the following:

- Infrastructure activities and functions that span the directorate:
  - Administration
  - Materials Program Leaders (MPLs)
  - Chief Scientist and Chief Technologist
  - Personnel
  - Assurance oversight
  - Operations
  - Resource management
  - S&T communications
  - Facility management
  - Security
  - Computer support
- Divisions that support the following organizing themes:
  - Materials Science and Technology Division (MSTD)—Materials properties and performance under extreme conditions
  - Chemistry and Chemical Engineering Division (CChED)—Chemistry under extreme conditions and chemical engineering to support national security programs
  - Chemical Biology and Nuclear Science Division (CBND)—Science supporting national objectives at the intersection of chemistry, materials science, and biology; also applied nuclear science for human health and national security
- Institutes and centers that provide strong interdirectorate collaborations, strong connections to UC, and a window to the world:
  - Glenn T. Seaborg Institute (GTSI)
  - BioSecurity and Nanosciences Laboratory (BSNL)
  - Forensic Science Center (FSC)

Figure 7. CMS Directorate Organizational Chart

*Acting

Directorate Awards

CMS uses the Directorate Awards and Spot Awards programs to recognize one-time achievements that have notable impact on the CMS Directorate and/or that contribute to the pursuit of excellence at LLNL. CMS awards are given in the following categories:

- Scientific/technical
- ES&H
- Leadership
- Operations and administration
- Institutional impact

Programmatic contributions are recognized by the program directorates through their awards programs.

Award Types and Criteria

Directorate Quarterly Awards

Directorate Awards are given quarterly, based on the nominations received, and provide individuals or teams with cash awards ranging from $75 to $1,000. The criteria for Directorate Awards are as follows:

- Significant scientific/technical accomplishment, breakthrough, or discovery
- Outstanding and/or unusual creativity and/or initiative used in accomplishing work assignments, including problem definition and solution
- Significant innovation by an individual or a team that contributes to progress towards the completion of a project milestone
- Exemplary performance to meet an important organizational need

Table 6 lists the FY03 recipients.

Spot Awards

Spot Awards, which consist of memorabilia and certificates of recognition, are distributed by senior managers. Recipient names are maintained by the division offices. The criteria for Spot Awards are as follows:

- Significant improvement of quality, efficiency, safety, and productivity in all categories
- Administrative or management practices that have a positive organizational effect
- Outstanding achievements in support of CMS Directorate goals or values (e.g., for community service, ES&H, cost-cutting/enhanced efficiency, educational outreach, and diversity)

Staffing and Demographics

As of September 30, 2003, the CMS workforce numbered 551. This workforce is composed of 65% career employees (358 total), 14% flex-term appointments (75 total), 7% postdoctoral researchers (37 total), 12% noncareer employees (65 total), and 3% (16 total) supplemental laborers (see Table 7 and Figure 8).

Table 8 and Figure 9 show a staff profile by degree composition for career employees, with a total staff of 358. About 72% scientists and engineers in CMS have PhDs. The staffing breakdown is 72% scientists and engineers, 16% technicians, and 12% administrative and clerical personnel.

A breakdown of the scientific staff by discipline is shown in Table 8. The scientific and engineering disciplines are composed of 15% physicists, 36% chemists, 12% engineers, 8% metallurgists, and 1% biological scientists, environmental scientists, mathematicians, and computer scientists.

Table 6. CMS Directorate Quarterly Awards in 2003

Name	Accomplishment
Olgica Bakajin	Excellence in Publication, “Single-molecule measurement of protein folding kinetics,” *Science*, August 29, 2003
Krishnan Balasubramanian	Distinguished 2003 Robert S. Mulliken Award
Keri Blobaum	Outstanding Poster Presentation at the 2003 Postdoctoral Program Symposium
John Elmer, Peter Terrill	Distinguished 2003 Warren F. Savage Award
Jim Fischer	Safety Analysis Program for Nonnuclear Hazards
Everett Guthrie	Sustained excellence in environmental radiochemistry
Giulia Galli Gygi, Chris Bostedt, Lou Terminello, Anthony Van Buuren	Excellence in Publication, “Quantum Confinement and Fullerenelike Surface Reconstructions in Nanodiamonds”
Ian Hutcheon	Excellence in Publication, “Lead Isotopic Ages of Chondrules and Calcium-Aluminum-Rich Inclusions”
Sergei Kucheyev	Excellence in Postdoctoral Research
Riad Manaa	Excellence in Publication, “Discovery of the Stable Structure of Buckyball $C_{48}N_{12}$”
Paul Mirkarimi	R&D 100 Award for Ion Beam Thin Film Planarization Process
Mark Stoyer, Cherie Napier	Restarted the InterLaboratory Working Group conference series
Jennifer Szutu	Exceptional service to CMS in the area of Labor Law
Yolanda Villa	Outstanding contributions and perseverance in the 2003 CMS Property Audit
Christopher Walton	R&D 100 Award for Extreme Ultraviolet Light for Full-Field Step-Scan System; award presented by PAT (shared cost)
Joe Wong, Daniel Farber, Adam Schwartz, Mark Wall, Florent Occelli, Carl Boro	Excellence in Publication, “Phonon Dispersion of fcc-Plutonium-Gallium by Inelastic X-ray Scattering,” *Science*, August 22, 2003
Jim Tobin	Organizer of the Second International Workshop on Spin Orbital Magnetism in Actinides, October 2002
T. G. Nieh	Recipient of the 2004 TMS Fellow Award
Ken Moody, John Wild, Mark Stoyer, Nancy Stoyer, Carola Laue	Discovery of superheavy elements 114 and 116
William Wilson	Excellence for the outstanding vision and tireless commitment displayed in defining and establishing the BioSecurity and Nanosciences Laboratory

Figure 8. Five-Year CMS Population Distribution by Workforce Category

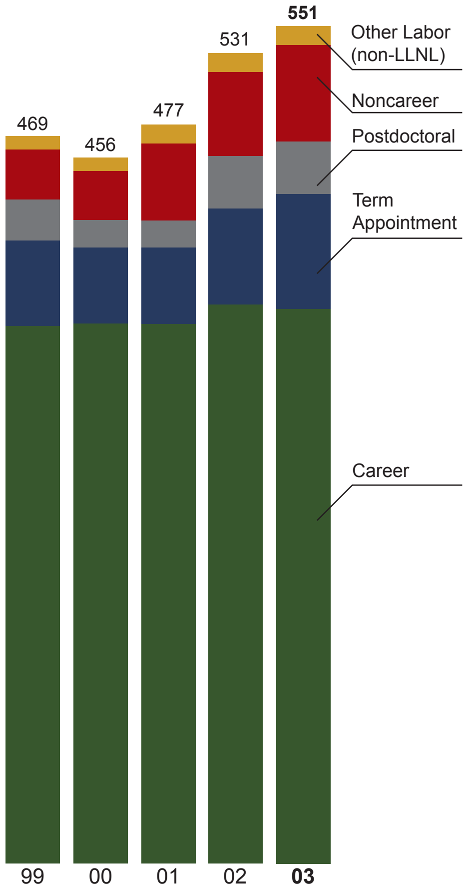


Table 7. CMS Workforce

Workforce Category	FY99	FY00	FY01	FY02	**FY03**
Career employees	338	342	341	360	**358**
Term appointments	58	52	51	62	**75**
Postdoctoral researchers	31	22	20	38	**37**
Noncareer employees	34	31	50	58	**65**
Other laborers (non-LLNL)	8	9	15	13	**16**
Total CMS Workforce	469	456	477	531	**551**

Figure 9. CMS Staff Profile by Degree Composition

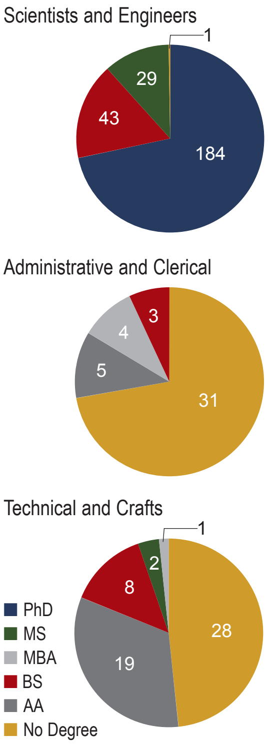
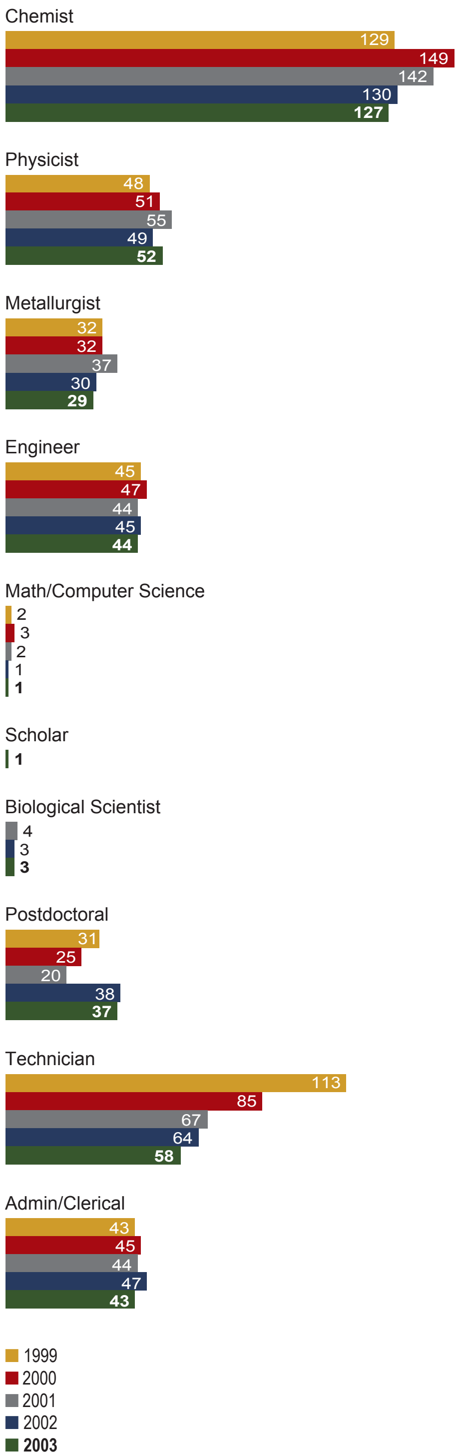


Table 8. CMS Staff Profile by Job Title and Degree Composition

Job Title	PhD	MS	MBA	BS	AA	No Degree	Total	Staff
Scientists and Engineers								
Physicists (270)	49	3	-	-	-	-	52	15%
Chemists (242)	87	13	-	26	-	1	127	36%
Engineers/Patent Engineers (168, 249)	24	9	-	11	-	-	44	12%
Mathematicians/Computer Scientists (256, 285)	-	-	-	1	-	-	1	0%
Biological Scientists (225, 277, 235, 228, 221)	-	-	-	3	-	-	3	1%
Metallurgists (265)	23	4	-	2	-	-	29	8%
Scholars (297)	1	-	-	-	-	-	1	0%
Total Scientists and Engineers	184	29	-	43	-	1	257	72%
Administrative and Clerical								
Management (196, 197)	-	-	3	-	-	-	3	1%
Administrative (100–162)	-	-	1	2	1	16	20	6%
Clerical/General Services (400–462)	-	-	-	1	4	15	20	6%
Total Administrative and Clerical	-	-	4	3	5	31	43	12%
Technical and Crafts								
Technical (302–339, 393, 347–391, 502–588, 593)	-	2	1	8	19	28	58	16%
Total CMS Workforce	184	31	5	54	24	60	358	100%
Degree Composition Percent	51%	9%	1%	15%	7%	17%	100%	

Excludes summer hires, temporary program participants, postdocs. Numbers in parentheses are the job classifications.

Figure 10. Five-Year CMS Staff Profile by Discipline



A staff profile by discipline spanning the past five years is shown in Figure 10.

Financial and Full-Time-Equivalent Highlights

Figure 11 shows a distribution of CMS FTEs spanning five years as well as the FTEs who are matrixed out to specific directorates to support Laboratory programs.

CMS funding sources for FY04 are illustrated in Figure 12 and summarized below.

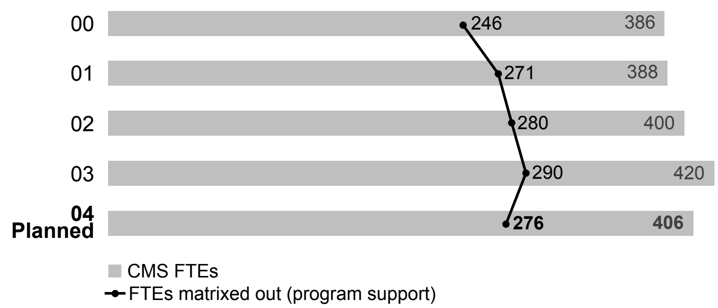
Internal CMS Funding

- **Discipline S&T**—Funding comes from DOE, federal, and nonfederal sponsors.
- **CMS Infrastructure**—Funding comes from the CMS Directorate program management charge (PMC), organizational facility charge (OFC), and organizational personnel charge (OPC) collections.
- **Institutional Investment**—Funding comes from the Laboratory's general and administrative (G&A), institutional general-purpose equipment (IGPE), and Laboratory Directed R&D (LDRD) collections.
- **Materials Computation, Analysis, and Processing (MCAP) Support Centers**—Funding comes from CMS Scientific Service Center collections.

Non-CMS Funding

- **Program Support**—The CMS Directorate primarily provides discipline personnel

Figure 11. Five-Year Distribution of CMS FTEs



for support to all Laboratory programs. Support for matrixed staff to program elements is received from other cost centers as FTE allocations.

Distribution of FTEs

Table 9 shows how CMS-managed activities are supported according to funding sources. There are four categories:

1. **Category 1—Discipline S&T** consists of research projects over which the directorate has jurisdiction. In FY03, this involved 12 CMS FTEs and 2 FTEs matrixed in from other organizations for a total budget of $9.1 million.
2. **Category 2—CMS Infrastructure** consists of indirect activities involved in operating the CMS Directorate. In FY03, this included 60 CMS FTEs and 41 FTEs matrixed in from other organizations for a total budget of $23 million.
3. **Category 3—Institutional Investment** consists of indirect activities. In FY03, this included 27 CMS FTEs and 16 FTEs matrixed in from other organizations for a total budget of $18.8 million.
4. **Category 4—MCAP Support Centers** consists of scientific services (e.g., analytical and processing activities) supporting Laboratory programs. In FY03, this included 29 CMS FTEs and 7 FTEs matrixed in from other organizations for a total budget of $6.9 million.

Figure 12. CMS Funding Sources

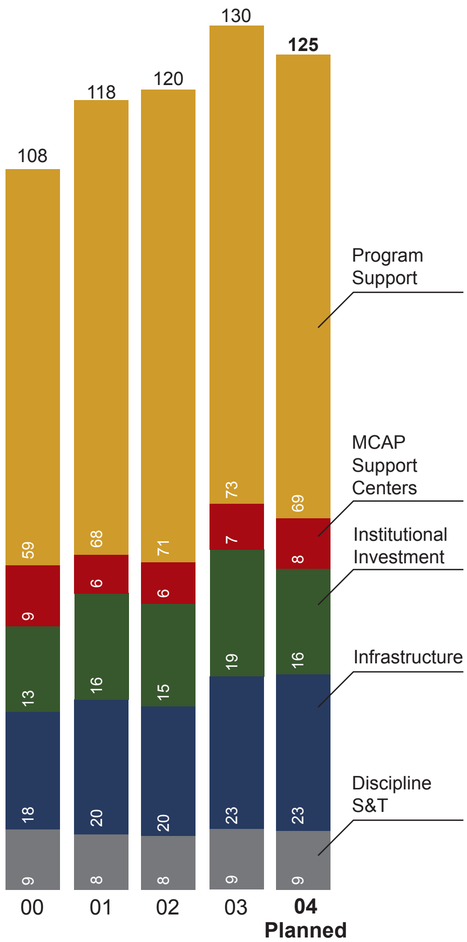


Table 9. Distribution of Operating and Capital Funds and FTEs for CMS Cost Centers

	FY03 Actual 9-30-03			**FY04 Planned 12-02-03**		
	$M	CMS FTEs	Other FTEs	**$M**	**CMS FTEs**	**Other FTEs**
Category 1—Discipline S&T						
Basic Energy Sciences (BES/KC02)	2.8	3	1	**2.9**	**4**	**1**
BES Capital Equipment/Fabrication	0.1	-	-	**0.2**	**-**	**-**
Other DOE Direct	0.5	1	1	**0.6**	**1**	**1**
Total DOE Direct	3.4	4	2	**3.7**	**4**	**2**
Work for DOE	1.6	5	-	**1.6**	**4**	**-**
Federal Agencies	3.1	3	1	**2.9**	**3**	**1**
Nonfederal	1.0	1	-	**0.7**	**1**	**-**
Total Work for Others	5.7	8	1	**5.1**	**8**	**1**
Total Category 1	9.1	12	2	**8.9**	**12**	**3**
Category 2—Infrastructure						
OPC	10.8	49	3	**10.9**	**48**	**3**
PMC	1.0	4	1	**1.0**	**3**	**1**
OFC	11.2	8	38	**11.5**	**9**	**36**
Total Category 2	23.0	60	41	**23.4**	**60**	**40**
Category 3—Institutional Investment						
G&A	9.2	16	10	**8.4**	**15**	**9**
G&A—Special Employee Program (Postdoctoral/Summer)	1.2	-	-	**1.2**	**-**	**-**
Institutional General Purpose Equipment	2.6	-	-	**1.3**	**-**	**-**
LDRD—Exploratory Research in the Disciplines	5.8	11	6	**5.0**	**13**	**3**
Total Category 3	18.8	27	16	**15.9**	**28**	**12**
Category 4—MCAP Support Centers						
Scientific Service Centers	6.9	29	7	**7.6**	**31**	**7**
Total CMS Operating and Capital	57.7	129	66	**55.8**	**130**	**62**

In FY03, the sum for the CMS-managed operating cost centers was $55 million with 195 FTEs (129 from CMS and 66 matrixed in). When added to the estimated cost of personnel (290 FTEs) matrixed to support the programs, the CMS Directorate's total operating cost was about $123.3 million with a capital-equipment budget of $2.7 million, for a total of $130.2 million.

In FY04, the CMS-managed operating cost center is expected to be $54.3 million with 192 FTEs (130 from CMS and 62 matrixed in). When added to the estimated cost of personnel matrixed (276 FTEs) to support the programs, the CMS Directorate's total operating cost would be about $123.3 million with a capital-equipment budget of $1.4 million, for a total of $124.8 million.

Figures 13 and 14 show operating and capital costs along with FTEs from FY00 to FY04 (planned).

Figure 13. Five-Year Distribution of Operating and Capital Funds for CMS Cost Centers

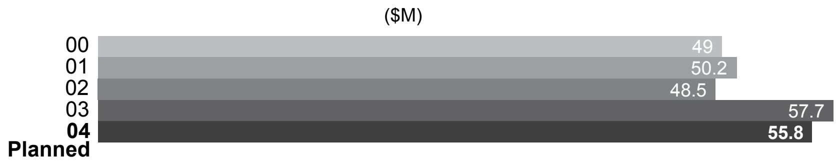
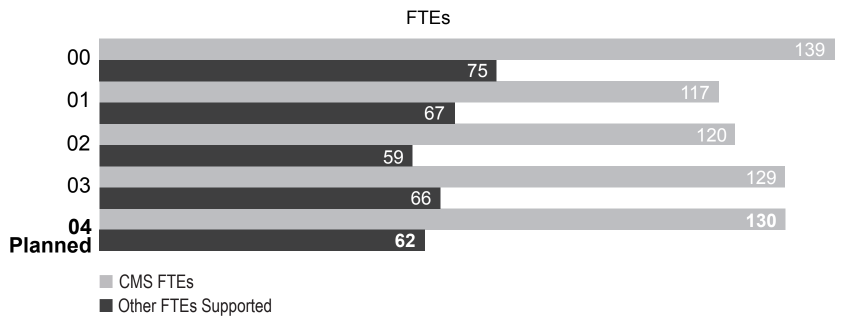
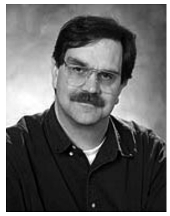


Figure 14. Five-Year Distribution of CMS and Other FTEs Supported for CMS Cost Centers



Operations

Al Moser,
Operations Manager



Joe Carlson,
Operations Manager

Operations' goal is to make it easy for CMS to focus on science and technology by providing leadership and management of the infrastructure activities necessary to ensure a high-quality, cost-efficient workplace for the execution of scientific and technical activities. Operations manages facility, safety, security, information technology, communications, and applications, business, and financial operations in support of CMS's mission (see Figure 15 for CMS Operations Management Structure).

Facility Operations

Strategic Space Planning and Utilization

- Current and future needs of facilities
- LLNL space and site planning interface
- CMS program area plans (Institutional)
- Return of facilities to the Laboratory

Facility Authorization Basis

- Safety analysis reports (SARs), hazard analysis reports, and authorization basis
- Facility safety plan (FSP) generation, review, and publication
- Emergency preparedness and response plans

Management and Maintenance of CMS Facilities

- Management of physical structures, building systems, and facility personnel
- Facility utilities (e.g., Laboratory facility charge, electricity, telephones, and industrial gases)
- Facility maintenance and improvements
- Project and construction management

Space Use and Utilization Processes and Leadership

- Coordination of space assignments, maintenance of tracking systems, and office move support and execution
- Laboratory/office transfers, room responsible person (RRP) assignments, and maintenance of RRP database
- Maintenance of billing information

Operation Services

Information Technology

- Computer Operations Desktop Support for Mac, PC, and UNIX systems
- Network maintenance operations
- Server administration
- Printer setup and service
- Open Labnet connections

Technical Communications and Applications

- Database development and maintenance
- Technical writing and editing
- Graphic design and illustration
- Directoratewide Web development and maintenance

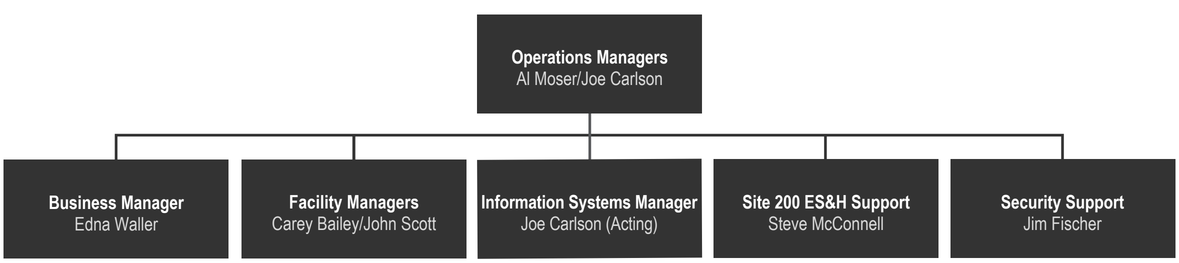
Financial Management

- Budgeting (external proposals and indirect budgets)
- Cost analysis, tracking, and reporting
- Account maintenance
- Audit representation and management oversight

Business Services

- Property management
- Procurement services provided through Technical Release Representatives (TRRs) and TRR Express, our online procurement system
- Storeroom supplies, including laboratory coats
- Business machines
- Vehicles (including sedans, vans, and pickups)
- Acquisition of excess equipment from other federal sites
- Conference-hosting support

Figure 15. CMS Operations Management Structure



Safety Services

- ISMS management
- Facility safety teams and safety officers
- Chemical and radiological management and tracking
- Full-service hazardous waste management
- Safety documentation including National Environmental Policy Act (NEPA), Environmental Impact Report (EIR), and National Emission Standards for Hazardous Air Pollutants (NESHAPS) management

Security Services

- Directorate Safeguards and Security Officer
- Information security (including review by Authorized Derivative Classifier, Information Management, and repository checking)
- Computer security
- Security plans

Please see our Web sites:

(external)
http://www-cms.llnl.gov/

(internal)
http://cmsonly.llnl.gov/

CMS has a Web-based cost analysis and tracking system that is being adopted by the Laboratory. The system, called CAFÉ, significantly improves the ability of principal investigators and resource analysts to financially manage their projects by providing timely information about costs, accounts, funding, and effort in a user-friendly, graphical environment.

Planning, Development, and Personnel

Lori Turpin, Deputy Associate Director

The Planning, Development, and Personnel (PDP) Office directs CMS strategic planning including the creation, development, and implementation of the long-term Strategic Plan and the implementation of directorate organizational changes required by key strategies. To fully realize our vision of being the premier provider of scientific leadership in support of Laboratory programs, we must meet and anticipate changes in programmatic needs through innovations in science and technology. We must also continue to provide an exceptional and safe work environment that attracts and retains a vital and diverse workforce.

Four research themes define our directorate's work and unite our staff in a set of common goals:

1. **Materials properties and performance under extreme conditions**—CMS investigates the properties and performance of metals (e.g., plutonium, tantalum, copper, iron, and tin) under extreme conditions of shock, pressure, stress, temperature, and strain rate, and also studies quantum-confinement and surface-passivation effects in nanomaterials.
2. **Chemistry under extreme conditions and chemical engineering in support of national-security programs**—We look for insights into the chemical reactions of energetic materials in the nuclear stockpile through models of molecular response to extreme conditions (e.g., quantum effects in chemical systems and energetic-material response during detonation) and for new techniques for processing energetic materials by using sol-gel chemistry.
3. **Science in support of national objectives at the intersection of chemistry, materials science, and biology**—We perform multidisciplinary research that supports national objectives by developing new technologies (e.g., carbon nanotube arrays, multiscale computational models, scanning probe nanolithography, and bioaerosol mass spectrometry) to combat chemical and bioterrorism, to monitor changes in the nation's nuclear stockpile, and to enable the development of advanced new methodologies for fundamental biology studies and human health applications.
4. **Applied nuclear science for human health and national security**—CMS performs nuclear science research that is being used to develop new methods and technologies for detecting nuclear materials, improving the treatment of advanced cancer, and assisting Laboratory programs that require nuclear and radiochemical expertise in carrying out their missions.

The PDP Office is responsible for staff and organizational development.

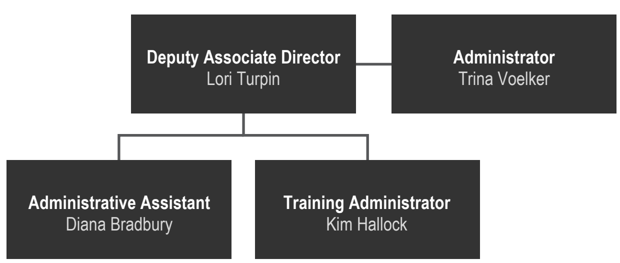
The directorate's organizational structure of divisions, centers, and institutes supports a team environment across disciplinary lines. This structure, which is summarized below, offers collaborative problem-solving opportunities that attract the best and the brightest from around the world.

- The divisions are responsible for the line management and the scientific, technical, and administrative leadership of the technical and administrative staff. Each division maintains a close relationship with Laboratory programs, working with directorate and program leaders to ensure an effective technical response to programmatic needs. The divisions conduct scientific and technical research in support of one or more of the four research themes.
- The centers provide specific research environments to support the nation's needs in biosecurity; chemical, nuclear, biological, and high-explosives counterterrorism; and R&D of explosives, pyrotechnics, and propellants.
- The programs at the institutes are tailored to reach a broad range of scientific talent, encourage and foster excellence, and attract quality scientists. Each institute provides a unique opportunity for outstanding students to experience big science in the dynamic environment of a national laboratory.

The PDP Office, organized as shown in Figure 16, is responsible for managing CMS Directorate personnel activities, including all aspects of the following:

- Performance management
- Salary and compensation procedures
- Recruiting
- Hiring and placement
- Awards and recognition programs
- Employee development
- Training
- Diversity and affirmative action initiatives
- All other personnel administrative activities

Figure 16. CMS Planning, Development, and Personnel Organizational Structure



Assurance Office

Doug Marden, Manager

The CMS Assurance Office is responsible for independent oversight of the implementation of ES&H within the directorate. To be able to perform this function, the Assurance Office is independent of the facilities and programs it is charged to assess, meaning that it is not assigned responsibility for the technical performance, cost, or schedule of facility or programmatic work. The Assurance Office reports directly to the AD the results of assessments, identified vulnerabilities, and areas of noncompliance.

Assurance Office Mission

The mission of the Assurance Office is to promote a safe work place and to reduce the potential for public and personnel injury. The goals of this office are to do the following:

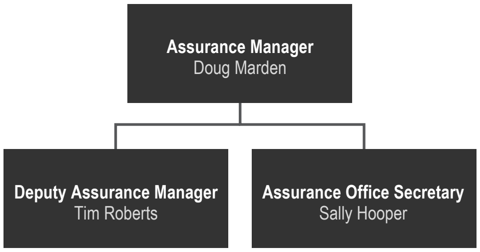
- Guide personnel in practices that maintain the integrity of Laboratory facilities and equipment and protect public property
- Provide the AD with assurance that CMS operations are in compliance with applicable laws and policies
- Favorably impact the ability of CMS programs to meet their goals
- Facilitate a healthy and knowledgeable ES&H culture
- Improve the quality of ES&H programs and documents, including those developed at the institutional level
- Encourage protection of the environment

2003 Accomplishments

The CMS Assurance Office, organized as shown in Figure 17, accomplished the following in 2003:

- Redesigned the CMS Self-Assessment Program to place more emphasis on key hazard areas (e.g., radiological, explosives, etc.) and reduce documentation needed for supervisor walkthroughs
- Reviewed revisions of the hazard analysis and safety documentation for CMS facilities to assure quality, consistency, and feasibility
- Managed the CMS DefTrack System for tracking of ES&H-related deficiencies
- Completed assessments or verifications of the following:
  - Beryllium work areas
  - Quality assurance and calibration
  - Integrated Safety Management
- Acted as the directorate point-of-contact, providing coordination and information as necessary, for the following activities external to CMS:
  - NNSA Type B Accident Investigation and DOE Office of Enforcement Investigation of the B-151 Extremity Overexposure Event
  - External audits and reviews (e.g., DOE/NNSA, LLNL Assurance Review Office, etc.)
  - The LLNL ES&H Working Group, including two subcommittees
  - Nonnuclear authorization basis pilot effort for Building 132N
  - Development of the 2003 Sitewide Environmental Impact Statement
  - Development of the LLNL Issues Management System
  - ES&H-related Lessons Learned
  - Storm Water Pollution Prevention certification
  - Chronic Beryllium Disease Prevention Program
  - University of California ES&H Performance Measures

Figure 17. CMS Assurance Office Organizational Structure



CMS Facilities

Building 155, the newest CMS facility was completed in 2003.

Map of Livermore site highlighting CMS facilities.

CMS manages several large scientific facilities (see Table 10) at Livermore (Site 200) and at Site 300 in support of Laboratory objectives. We house more than 500 employees who conduct experiments in more than 250 laboratories. Work completed in CMS facilities range from nanoscale science, to computational chemistry, to certified environmental analyses, to high explosives synthesis and processing. CMS Operations supports these activities and manages associated hazards cost effectively, providing a safe and secure environment to conduct world-class chemistry and materials science.

Site 200, the LLNL main site, is located within the Livermore city limits on one square mile of land. CMS facilities are in the heart of the Laboratory, and all CMS facilities are within walking distance of one another. We have responsibility for more than 400,000 gross square feet of space, including 10 permanent buildings and 6 trailers. The newest facility, Building 155, is one year old, and Building 241 is the oldest at 44 years of age.

Site 300 is set on 7000 acres of land in a relatively remote area about 15 miles east of Livermore. It is marked by both rolling hills and steep ravines, with very few trees in sight. CMS facilities at Site 300 are used for scaleup of high-explosives work, including synthesis, processing, and waste treatment. We have responsibility for more than 60,000 gross square feet of space, including 25 permanent buildings and 11 magazines. The facilities range from 7 to 50 years old.

Standard metrics indicate that our facilities are both well-maintained and highly utilized.

Figure 18 charts the facility condition index for our facilities at Sites 200 and 300. The facility condition index, a standard industry metric, is the maintenance backlog as a percentage of the replacement value of a facility. The average facility condition index for CMS Site 200 facilities is lower than the Laboratory average and within the industry standard for good practice. We have worked hard to identify and mitigate the highest priority maintenance issues in CMS facilities. CMS completed $1.7 million in maintenance backlog projects in FY03, with an additional $3.3 million in approved projects for FY04. The total deferred maintenance for CMS is now $8.2 million for Site 200 and $4.3 million for Site 300. An important upgrade and replacement of CMS processing facilities at Site 300 is

Table 10. CMS Facilities Profile

Building	Facilities	Building Characteristics	Primary Functions	Facility Replacement Value*
Site 200				
B132N Complex Chemistry Laboratories Complex	• B132N—9 years old • B133—9 years old • T1602—25 years old • T1927—26 years old	• 139,059 gross square feet • Limited access • Wet chemistry • 32 laboratories • 107 offices	• Synthesis, formulation, and processing chemistry • Chemical analysis • Forensic science	• Facility—$86M • Equipment—$22 M
B151 Complex Analytical and Isotopic Laboratories	• B151—36 years old • B154—13 years old • B155—1 year old • T1541—20 years old	• 108,473 gross square feet • Limited/controlled access • Wet chemistry • 71 laboratories • 183 offices	• Isotope sciences and radiochemistry diagnostics • Analytical and characterization services and technology • Geochemistry • Stockpile stewardship • Glenn T. Seaborg Institute • 150-seat auditorium	• Facility—$61.4M • Equipment—$21M
B235 Materials Science Laboratories	• B235—17 years old • B232—47 years old • T2428—27 years old • T2475—1 year old	• 88,368 gross square feet • Limited/controlled access • Instrument laboratories • 30 laboratories • 153 offices	• Materials development and technology • Material and chemical process theory, modeling, and computation • Materials characterization services and technology	• Facility—$33M • Equipment—$20M
B241 Materials Technologies Facility	• B241—44 years old • T2425—41 years old	• 56,652 gross square feet • Controlled access • Instrument laboratories • 30 laboratories • 1 hi-bay • 70 offices	• Materials development and technology • Materials disposition • Materials containment • Biological laboratories	• Facility—$25M • Equipment—$6M
Site 300				
Chemistry Area	• 8 buildings between 35–44 years old	• 21,954 gross square feet • Limited access • 10 bays • 3 storage magazines	• Synthesis • Formulation • Mechanical pressing • Scaleup	• Facility—$7M • Equipment—$0.7M
Process Area	• 11 buildings between 21–46 years old	• 33,979 gross square feet • Limited access • 14 bays • 3 storage magazines	• Hot isostatic press • Radiography • Machining • Inspection • Assembly	• Facility—$13M • Equipment—$4.3M
Explosives Waste	• 5 buildings between 7–50 years old	• 2,729 gross square feet • Limited access • 5 storage magazines • 1 burn cage and pan	• Waste Storage • Waste Treatment	• Facility—$7M • Equipment—$0.03M

*Facility Replacement Value = original acquisition cost adjusted for inflation. Equipment (capital and attractive) cost is original acquisition cost only.
B = Building
T = Trailer

Figure 18. Facility Condition Index

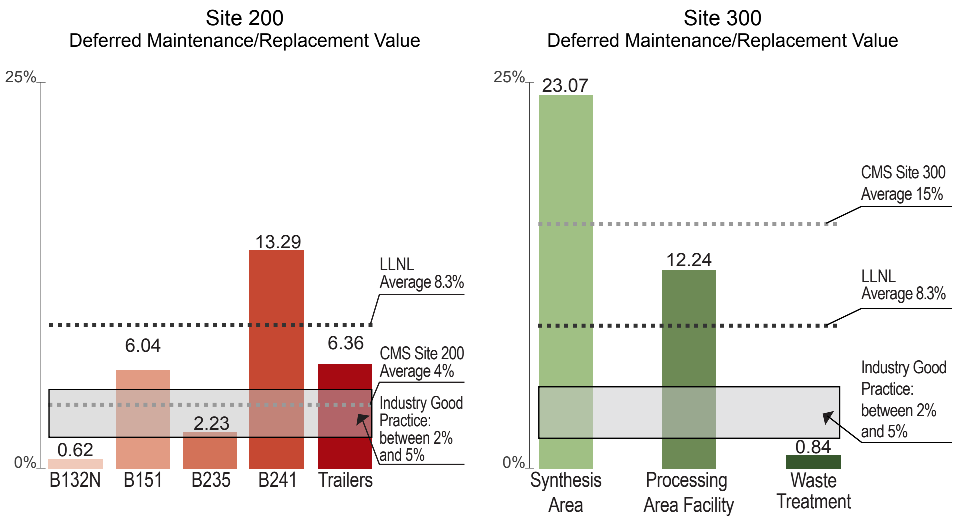


Figure 19. FY03 Planned Availability for CMS Facilities at Site 200

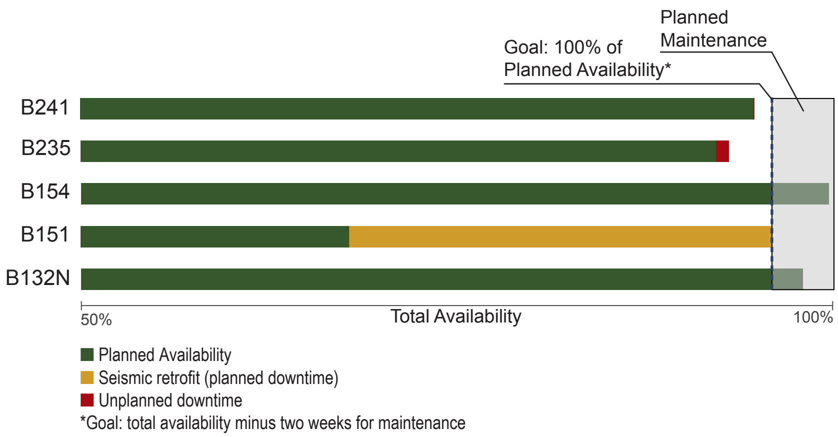
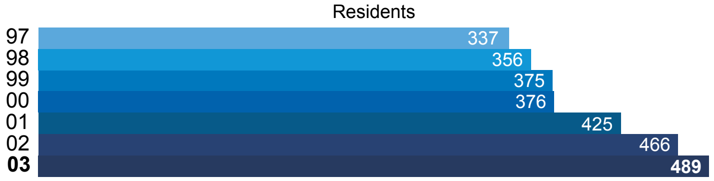


Figure 20. CMS Resident Growth



underway. This $50-million project is scheduled for completion in FY08 and is evidence of the continuing importance of this capability to the Laboratory. Completion of this major project will significantly improve the state of our facilities at Site 300.

Facility availability is key to the success of CMS Operations and the programs we support. Figure 19 depicts the availability of major CMS scientific facilities at Site 200 for FY03. The goal of CMS Site 200 Facility Operations is to minimize unplanned facility downtime (i.e., facility equipment failures) by scheduling maintenance windows (planned facility downtime) of two weeks per year. We want our facilities to be 100% available the other 50 weeks of the year. The chart shows good performance in managing unplanned downtime and, other than Building 151, shows good performance in managing planned facility downtime. The level of planned downtime is generally correlated to the level of reinvestment projects in the facility. For instance, a major seismic retrofit project and ventilation upgrades were completed in the Building 151 complex. We also completed major air-conditioning replacements in Buildings 235 and 241.

Figure 20 indicates the increase in CMS facility residents over the last several years. Despite the rapid growth of residents in CMS facilities, we have continued to provide high-quality office space. Even with a 45% increase in the number of residents since FY97, only 11% of our residents are housed in trailers versus 26% for LLNL as a whole. Furthermore, we added high-quality office space last year by completing construction of Building 155, which included 60 offices and a large auditorium, and we are planning to add another 50 offices in FY04.

Facility Use by Directorate

CMS facilities are used to support a wide variety of Laboratory programs and organizations. Table 11 and Figure 21 illustrate the multiprogram nature of CMS facilities. The primary users of CMS facilities continue to be CMS, DNT, and NAI.

Facility Services Provided

CMS facility staff provide a wide variety of services to our residents:

- **Utilities and services** included laboratory facility charge (LFC), electricity usage, industrial gas, and telephone communications.
- **Safety** included equipment electrical inspections, ergonomic assessments, ES&H and hazardous waste management (HWM) supplies, and support safety officers, facility safety chairpersons, Assurance Office, ES&H staff, and HWM technicians.
- **Information Systems** included support for more than 1200 desktop Macintosh, PC, and UNIX computer systems including classified computing, network installation and connectivity, printer setup and service, trouble resolution, system adminstration, computer security, and server administration.
- **Operations** included operation management, database maintenance and development (e.g., Integrated Work Sheet, MoveIt, ChemIt, and TRR Express) and support from the AD facility manager and facility coordinators.
- **Business Services and Consumables** included property management, storeroom with office and laboratory supplies, copiers, facsimiles, government vehicles, common area printers, and labor services as established by the Operation Managers.
- **Maintenance** included ongoing support from custodians, painters, plumbers, electricians, welders, and laborers as directed by CMS facility coordinators for work on TESA locks, liquid nitrogen and retention tanks, and fire extinguishers. Work also included testing oxygen systems, painting, installing carpets, repairing dry-wall, installing white boards, repairing keyboard tray, installing lights, installing seismic bracing, repairing eye wash and shower, repairing kitchenette, sanitizing water coolers, and cleaning up and repairing damage from water. One-time projects included implementing new code requirements for roof ladders, decomissioning an elevator, reconfiguring a fence, studying of skylight structure, sealing utility ports, installing a gas regulator, evaluating an air system, and installing roof access and fume hood signs, Building 153 lighting, and a new glove box.

In FY03, the costs of these services was $11.2 million for Site 200 and $1.6 million for Site 300. Figure 22 presents the percentages of cost for these services.

Table 11. Directorates Charged for Site 200 CMS Space

Directorate	FY03 ($K)	%
CMS		
MCAP Support Centers	1,099	9%
Infrastructure	1,245	11%
Institutional Investment	988	9%
Discipline S&T	412	4%
DNT	3,202	29%
NAI	1,444	13%
SEP	594	5%
E&E	562	5%
NIF	314	3%
Deputy Director Science—LDRD	371	3%
Engineering	211	2%
Various	718	6%
Total C&MS Space	11,157	100%

September 30, 2003
Site 300 is not included because it is funded by G&A.
$K = thousands of dollars

Figure 21. Percentage of CMS Facility Services and Operating Costs for Site 200

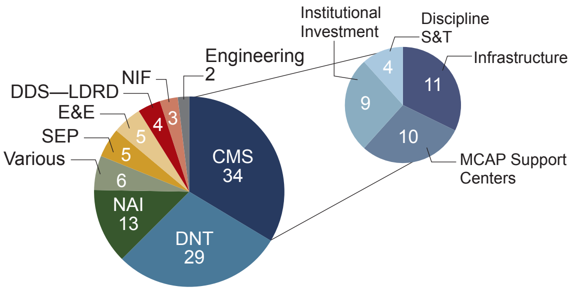
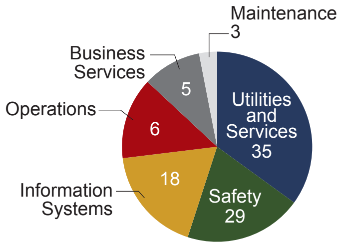


Figure 22. Percentage of Cost for CMS Services



CMS Facility Infrastructure Planning

Goal and Objectives

Successfully achieving the CMS mission requires simultaneous excellence in operations and science and technology. To this end, the goal of CMS Operations is to provide the optimal infrastructure to create a cost-effective, safe, and secure environment to support world-class chemistry and materials science now and in the future. Our objectives are to integrate the infrastructure requirements of the CMS strategic plan in order to:

- Manage existing facilities so that they are safe and available to perform the scientific and programmatic work of the directorate, including management and disposition of legacy materials and equipment.
- Identify the need for facility upgrades and replacement consistent with the evolving scientific and programmatic directions.
- Integrate the evolving equipment and technology needs and requirements so as to constantly provide for modern facilities and equipment for the directorate.
- Provide modern, usable space for the staff in terms of offices, meeting rooms, and administrative areas. This must be integrated with the staffing plans so as to anticipate evolving needs within the directorate.

Strategic Planning Process

The rapid advancement of science and technology in chemistry and materials science requires us to constantly reinvest in our facility infrastructure to keep it vital and relevant for work on our most challenging scientific and programmatic problems.

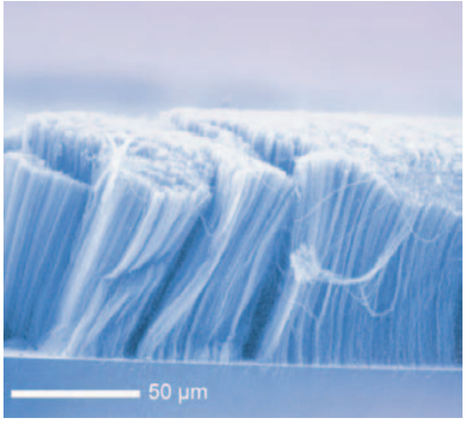
We are integrating CMS' infrastructure and science and technology strategy, both within the directorate and with the overall Laboratory, emphasizing collaborations with other directorates and balancing programmatic and scientific objectives.

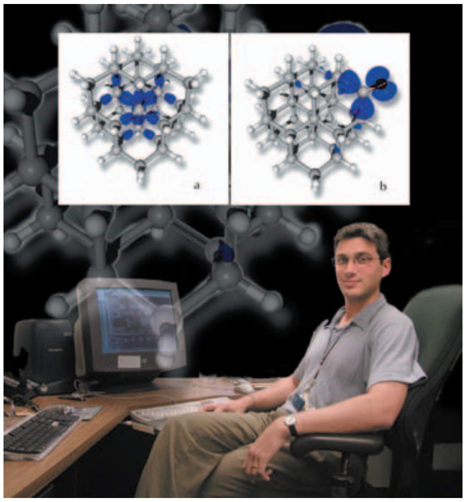
CMS investment is guided by our strategic planning process, which has identified four S&T themes listed below and described in more detail on page 23:

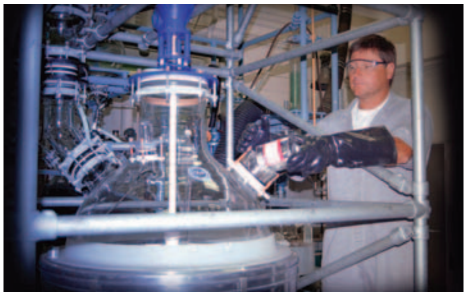
- Materials properties and performance under extreme conditions (MPPX)
- Chemistry under extreme conditions and chemical engineering in support of national-security programs (XCHEM)
- Science in support of national objectives at the intersection of chemistry, materials science, and biology (CBMX)
- Applied nuclear science for human health and national security (ANS)

Working with the S&T theme leaders and senior scientists, CMS Operations developed a facilities infrastructure plan to sucessfully integrate the needs of our S&T themes. Several important needs emerged as key to implementing our S&T themes:

- P-Cleared Labs—Laboratories in areas accessible to P-cleared employees is vital to attracting and retaining employees. Most of our research does not require access to classified information, even if the work supports classifed projects. Additional laboratories in P-cleared areas would enable us to attract new employees, enable new employees to be productive more quickly, and improve collaborations with universities and corporations.
- Nanoscale Laboratories—The ability to work at the nanoscale level is essential for achieving many of our S&T objectives; however, the stringent requirements of modern science, let alone the rapid advancement in nanoscale science in the last few years, were not anticipated when some of our scientific facilities were constructed 30 to 40 years ago. Nanoscale laboratories require tight controls over vibration, sound, temperature, and dust. Retrofitting existing laboratories sometimes yields poor results. For example, producing nanotubes within existing laboratory space has proven challenging and diverted scientists from







From upper left: Carbon nanotubes are 1/50,000th of the width of a human hair but a hundred times stronger than steel at one-sixth the weight. CMS can make many kinds of nanotubes—single wall, multiwall, thick, thin, single isolated, or arrays. A close packed array of multiwall nanotubes is shown above. Upper right: After synthesis in a laboratory, a new explosive is scaled up in a pilot plant at Site 300. Lower left: Quantum Monte Carlo simulations are being used by Laboratory scientists to research characteristics of nanostructures such as these 71-atom silicon quantum dots. Lower right: Chemist makes a sol-gel to create an energetic material (background). Sol-gel chemistry has been the key to development of energetic materials with improved or entirely new properties.

their research. To prepare for future work, we have taken measures and reserved the best space suited for nanoscale work and will optimize it for nanoscale science.

- Flexible, Open Designs—Flexible laboratory space is also needed in our facilities. Flexible and open layouts can be reconfigured to meet new S&T requirements more quickly and more inexpensively than standard designs.
- High-Quality Office Space—The importance of colocating work groups in high-quality office space close to their laboratories cannot be underestimated. It helps attract new talent and makes integrating new employees easier. Easily accessible meeting areas conducive to informal meetings promotes interdisciplinary and team problem-solving.

Other themes that are not yet incorporated into the plan are emerging; however, we expect the infrastructure plan to constantly evolve and adapt over time. We continue to need a long-term plan for plutonium work in Building 235, describing how we will support future target fabrication efforts in the facility. We also need a plan for the future of the hibay in Building 235 after the decontamination and decommissioning (D&D) of the existing accelerator is complete.

Facility Infrastructure Plan

The facility infrastructure plan looks 2–5 years into the future and forms the foundation for developing a long-term facility plan that addresses the future configuration of our existing facilities and the need for construction of a modern materials facility.

The midterm facility infrastructure plan, however, has identified several projects that are vital to implementing our strategic plan and supporting our workforce. Table 12 illustrates our multiyear plan for completing these projects and how our projects cross-cut each strategic theme. These projects include constructing new facilities, revitalizing existing facilities and laboratories, and managing the dispostion of legacy materials and equipment.

The projects focus on creating laboratory space in P-cleared areas for conducting science at the nanoscale level and creating high-quality office space for our employees.

Table 12. Multiyear Plan for Completing Projects

	FY03	FY04	FY05	FY06	FY07	FY08	Themes 1	2	3	4
New Facilities										
Building155	■								●	●
Building 240		■	■				●			
Engergetic Materials Processing Center		■	■	▒	▒	▒		●		
Modern Materials Facility						▒	●	●	●	
Revitalization										
Isotope Sciences Facility	■	■							●	●
Revitalization, Consolidation, and Reconfiguration										
Nuclear Magnetic Resonance Laboratory	■							●	●	
Aerosol Laboratory	■							●	●	
Nano-Secondary Ion Mass Spectrometry	■							●	●	●
Precision Materials Characterization Laboratory		■	■				●	●		
Materials Dynamics Laboratory		■	■				●	●		
Nanoscale Synthesis and Characterization Laboratory		■	■	■			●	●	●	
Gigabit Ethernet			▒	▒			●	●	●	●
Biophysical Analysis and Characterization			▒	▒	▒				●	●
P-Cleared Laboratories				▒	▒		●	●	●	●
Facility Infrastructure Reinvestment Program and Maintenance Reinvestment	■	■	▒	▒	▒	▒	●	●	●	●
Legacy Cleanup										
Gloveboxes	■	■								
Beryllium Laboratories		■	■							
Storage			▒							
Accelerator			▒	▒						
Return to Institution—Site 200		■	■							
Return to Institution—Site 300					■	■				

■ funded
▒ unfunded

1. Material properties and performance under extreme conditions
2. Chemistry under extreme conditions and chemical engineering in support of national security programs
3. Science in support of national objectives at the intersection of chemistry, materials science, and biology
4. Applied nuclear science for human health and national security

Upper left: In FY03, we achieved a significant reduction in waste management costs by finding and removing contamination in the Building 151 retention system, **eliminating the single largest source of radioactive waste at LLNL.** Lower left: Revitalization of the Nuclear Magnetic Resonance Laboratory. Upper right: Rendering of Building 242 to be constructed next to Building 235.

New Facilities Projects

We have initiated several projects to add or replace facilities to ensure we can house our employees adequately and meet future program requirements.

- **Building 155**—We recently completed construction of an office building adjacent to the Isotope Sciences Facility (Building 151). The new office building houses 60 employees and includes three conference rooms and a modern 150-seat auditorium.
- **Building 242**—We are coordinating with the Laboratory on constructing an office building that will house 100 employees in modern office space next to our materials science research facility (Building 235).
- **Energetic Materials Processing Center (EMPC)**—We are working with DNT to modernize the processing area at Site 300 by constructing the EMPC. In FY04, we expect funding for design of a facility that will handle machining, radiography, assembly, and inspection of energetic materials.
- **Modern Materials Facility (MMF)**—We are evaluating the need for a MMF at Site 200.

Facility Revitalization

Where appropriate, we revitalize our facilities to ensure that we can deliver on our commitments and anticipate change through innovation in science and technology. Our facility revitalization projects include:

- **Isotope Sciences Facility (ISF) line item**—Completion of the ISF, which will:
  - Allow CMS to use Building 154 as intended as a laboratory facility (FY02)
  - Provide 60 new offices (FY03)
  - Seismically upgrade Building 151 (FY03)
  - Complete heating, ventilation, and air-conditioning (HVAC) upgrades in Building 151 (FY04)
  - Allow CMS to deal with the legacy waste issues in Building 241 (FY04)
- **Revitalization, Consolidation, and Reconfiguration (RCR)**—Current RCR projects focus on creating P-cleared laboratory space to support two of our S&T focus areas: (1) inorganic synthesis of novel materials and ultrafast characterization, and (2) molecular recognition chemistry and bioanalytical characterization and imaging. In FY03, we completed the Nuclear Magnetic Resonance (NMR), Aersol, and Nano-Secondary-Ion Mass Spectrometry (SIMS) laboratories in Building 151. We are now beginning alterations in the remaining areas best suited for conducting nanoscioence. The laboratories will feature flexible configurations using an open-space design and will house future capabilities such as the Nanoscale Synthesis and Characterization Laboratory (NSCL), Precision Materials Characterization Laboratory (PMCL), Materials Dynamics Laboratory (MDL), and Biophysical Analysis and Characterization (BPAC) facility.
- **Facility Infrastructure Reinvestment Program (FIRP)**—FIRP, along with maintenance reinvestment funding provided by the Laboratory, will replace old infrastructure components in CMS facilities, including air handlers, boilers, and roofs. Most work is now focused on revitalizing the HVAC systems in Buildings 151 and 241.

Legacy Space Reduction

We are eliminating legacy material and equipment in CMS facilities, thereby reducing risk and costs while increasing facility use. By the end of FY04, we will have returned to productive use more than 25,000 square feet of space previously occupied by contaminated or hazardous equipment and materials.

Since the project began in FY01, we have identified legacy space in CMS facilities, implemented surveillance and maintenance plans, completed disposition projects with the Space Action Team and CMS facility staff, and developed a management process to identify and prevent future legacy issues.

FY04 work will focus on the D&D of contaminated gloveboxes in the low-bay of Building 241. We also will begin D&D of the last beryllium-contaminated legacy laboratory in CMS facilities.

Research Administration and Funding

Research is considered an integral part of the CMS Directorate's discipline development. Oversight and policy-making are vested in the AD's office. Currently, the Deputy AD for Science and Technology assumes general responsibility for administering the research effort, with guidance from the CMS AD and in consultation with division and program leaders. Programs and projects are reviewed internally as well as externally. Funding for R&D that is managed in the directorate comes primarily from LDRD, the DOE Office of Basic Energy Sciences (OBES), and reimbursable work for others.

Laboratory-Directed Research and Development

An order issued by DOE provides for an LDRD program that uses an annual percentage (6%) of the Laboratory's budget for discretionary research. Livermore's LDRD program is divided into three major funding categories: Strategic Initiatives (SIs); Exploratory Research in the Disciplines (ERD), Programs, and Institutes; and Laboratory-Wide Competition (LW).

Strategic Initiatives

SI projects must be strongly aligned with the Laboratory's strategic directions and long-term vision. A SI project should describe innovative R&D activities that are likely to set new directions for existing programs, that will help develop new programmatic areas within our mission responsibilities, and/or that will enhance the Laboratory's S&T base. CMS scientists may either lead SIs as principal investigators or participate as key team members on program-sponsored initiatives.

Exploratory Research in the Disciplines, Programs, and Institutes

These R&D activities are intended to support pioneering R&D projects that set new directions for the Laboratory and/or enhance the core competencies and the S&T base for the Laboratory. ERD projects are funded by R&D collections returned to the directorates that generate the funds. Such funds are designated to provide the technical base for developing both existing and future programs for the Laboratory. CMS frequently plays a role in these projects through personnel supporting the execution of the science and occasionally by providing the leader for the project. In general, support for a project is limited to, at most, three consecutive years in this program. Table 13 shows FY04 CMS ERD projects.

The primary focus of CMS within its LDRD ERD portfolio is to support the longer-range research objectives of the Laboratory's programs. CMS influences the direction and development of these objectives by contributing to new science and capabilities. Two strategic objectives define how CMS uses its ERD portfolio:

1. **Program-Related ERDs.** Fundamental research that provides a basic scientific understanding of a specific issue faced by a program and acknowledged by the program as being important. CMS refers to this as program-related LDRD, and in many cases, CMS is successful in encouraging programs to coinvest their LDRD funds on these projects. Table 13 summarizes program-related CMS projects and associated programmatic coinvestments.
2. **New Scientific Capabilities.** Development of new science and capabilities focused on chemistry that will seed enduring, externally funded, fundamental science in areas of current or future importance to the Laboratory. CMS refers to this grouping of projects as new scientific capabilities. In some cases, these projects represent a new focus area such as computational chemistry, biochemistry, health sciences, and nanosciences, as shown in Table 13.

CMS' selection process focuses on projects meeting these strategic objectives, but it also considers several other important criteria:

- Projects must be based on the execution of excellent science.
- Whenever possible, projects should provide an opportunity for more experienced scientists in CMS to work with younger staff (especially postdoctoral researchers) in a mentoring relationship.
- Partnering and collaboration with other directorates is encouraged in all areas and is required for program-related research.

Laboratory-Wide Competition

Projects in this category emphasize innovative research concepts and ideas with limited management filtering to encourage the creativity of individual researchers. Table 13 also includes three LW projects, which are managed by the Laboratory's Science and Technology Deputy Director.

Table 13. CMS FY04 LDRD Projects and Funding Levels ($K)

CMS Contacts		Project Title	Funding	Directorate Cofunded	Capital
Exploratory Research in the Disciplines					
Program-Related ERD—DNT					
J. Wong	03-ERD-017	Phonon Dispersion Curves Determination in Delta-Phase Pu-Ga Alloys	$150	$375	
J. McNaney	03-ERD-015	Strain Rate Scaling of Deformation Mechanisms	$125	$175	
J. Colvin	03-ERD-018	Determination of the Microstructural Morphology of Shock-Induced Melt and Resolidification	$125	$200	
M. Fluss	03-ERD-077	Plutonium and Quantum Criticality	$200	$300	$465
A. Nelson	04-ERD-010	Time-Resolved Dynamic Studies Using Short-Pulse X-Ray Radiation	$200	$180	
J. Satcher	04-ERD-022	Designer Nanocellular Materials for Targets and Other DNT Applications	$200	$300	
E. Bringa	04-ERD-021	High-Strain-Rate Deformation of Nanocrystalline Metals	$200	$150	
L. Fried	04-ERD-069	Ionization Chemistry of High-Temperature Molecular Fluids	$100	$200	
Program-Related ERD—NIF					
J. Britten	03-ERD-059	Large-Aperture Diffraction Gratings, the Enabling Technology for High-Energy Petawatt Lasers	$413		
M. McElfresh	03-ERD-074	Novel Methods for Bonding Disparate Materials	$280		
Program-Related ERD—NAI					
C. Westbrook	02-ERD-027	Local-Scale Atmospheric Reactive-Flow Simulations	$100	$175	
E. Gard	02-ERD-002	Single-Cell Proteomics with Ultrahigh-Sensitivity Mass Spectrometry	$150	$200	
A. Malkin	03-ERD-074	Multiprobe Investigation of Proteomic Structure of Pathogens	$100	$200	
J. Camarero	04-ERD-040	Developing New Tools for the In Vivo Generation and Screening of Cyclic Peptide Libraries	$125	$200	$62
Program-Related ERD—E&E					
J. Moran	02-ERD-058	Transport and Biogeochemical Cycling of ^{129}Iodine from Nuclear Fuel Reprocessing Facilities	$165		
New Scientific Capabilities—Comp.					
A. Quong	02-ERD-016	A 3D Model of Signaling and Transport Pathways in Epithelial Cells	$125		
New Scientific Capabilities—Biochem/Health Sciences					
C. Hollars	02-ERD-018	Development of Ultrasensitive High-Speed Biological Assays Based on 2D Flow Cell Detection of Single Molecules	$200	$171	
S. Letant	03-ERD-013	DNA Detection through Designed Apertures	$230	$40	
J. Perkins	04-ERD-007	Dynamic Combinatorial Libraries for Target-Driven Ligand Development	$300		
P. Weber	04-ERD-039	Bioforensics—Attribution of Biological Weapons Agents by Nano-SIMS	$150		
New Scientific Capabilities—Nanoscience					
D. Eaglesham	03-ERD-050	Carbon-Nanotube Permeable Membranes	$300		$2
New Scientific Capabilities—General					
T. Gonis	03-ERD-064	A Two-Particle Formulation of Electronic Structure	$200		
O. Bakajin	02-ERD-040	Development of a Fast Microfluidic Mixer for Studies of Protein-Folding Kinetics	$75		
Total ERD			$4,213	$2,866	$529
Laboratory-Wide Competition					
W. Cai	03-LW-027	Long-Time-Scale Atomistic Simulations	$190		
B. Hart	03-LW-047	Laser-Initiated Nanoscale Molecularly Imprinted Polymers	$186		
T. Huser	03-LW-056	Coherent Antistokes Raman Microscopy—Specific Molecular In-Vivo Imaging at Super Resolution without Fluorescence Labels	$83		
Total LW			$459	$0	$0

Minor variance may occur due to rounding.

DOE Direct

The CMS Directorate coordinates funds obtained from the OBES Division of Materials Sciences, which total $2.8 million for FY04 (see Table 14). CMS is responsible for executing the majority of the program as well as for reporting, oversight, and review of the entire program. The Livermore OBES/Division of Materials Sciences Program has three major components:

1. The **Metallurgy and Ceramics Program** addresses a diverse range of research topics, including the science of adhesion and bonding at internal interfaces, high-performance modeling and simulation of microstructural evolution in materials under dynamic conditions, and fundamental investigations of welding processes.
2. The **Solid-State Physics Program** addresses new concepts in modeling radiation damage in solids, development and characterization of new optical materials including new lasing materials, development of positron spectroscopy as a key materials characterization technique, and high-performance computational nanoscience.

- The **Materials Chemistry Program** addresses the determination of the electronic structure and atomic geometry of thin, buried heterointerfaces, exploration of innovative new techniques for investigating the magnetic properties of materials at the electronic and atomic levels, and synthesis and characterization of nanoscale materials.

Scientific and Technical Achievements

Table 15 lists some of the CMS Directorate's scientific and technical achievements in our divisions for the 2003 calendar year.

Table 14. CMS FY04 OBES Projects and Budgets ($K)

CMS Contact	Project Title	Operating	Capital
Materials Science			
W. King	Adhesion and Bonding	274	
A. Denison P. Asoka-Kumar	Positron Sciences	242	
J. Elmer	Welding Metallurgy Group	434	
S. Payne	Optical Materials	188	
A. Quong	Radiation Damage	188	
A. Denison	Positron Annihilation	85	
V. Bulatov	Microstructural Effects on Mechanisms of Materials	52	
T. Baumann	Electroactive Polymers Nanoscience Network	20	
G. Galli	Computational Nanoscience	400	
L. Terminello	Advanced Heterointerfaces	321	
J. Klepeis	Advanced Heterointerfaces	20	
J. Tobin	Nanoscale Materials	341	
J. Tobin	Spin-Polarized Transport	10	
J. Tobin	Nano-Magnets	10	
L. Terminello	Capital		250
Total CMS OBES		$2,585	$250

Table 15. CMS Scientific and Technical Achievements in 2003

Metric	CBND	MSTD	CCHED	**2003**
Major Awards	2	6	6	**14**
R&D 100 Awards	-	2	-	**2**
Patent Disclosures	6	7	10	**23**
Patent Applications	5	-	7	**12**
Patents Issued	1	2	4	**7**
Licenses Executed	-	-	3	**3**
Refereed Publications	53	108	80	**241**
Invited Presentations (Major Conferences)	11	30	31	**72**
Contributed Presentations	53	67	73	**193**
Journal Editorships	-	8	3	**11**
Conferences Organized	9	17	3	**29**
Editorial Boards	-	5	6	**11**
Total CMS Achievements	140	252	226	**618**

Figure 23. Chemical Biology and Nuclear Science Division Organization

Resource Manager—R. Martin
Administrator—B. Royval
Personnel Relations—B. Lanier
BSNL Director (Acting)—J. DeYoreo

IPA Assignments:
NNSA—S. Kreek
DOE—N. Stoyer

Division Leader—Al Ramponi

Deputy Division Leader, Operations—Bryan Bandong

Deputy Division Leader, Science and Technology (Acting)—Dave Smith

BSNL Secretary—B. Bollinger
Program Secretary—E. Davis
CAS, Program Secretary—R. Kamerdula
DL & DDL S&T Secretary, Division Secretary, Timekeeper D. Lindo
GTSI Administrator, Chemical Sci. Admin. Lead—B. McGurn
Nuclear Science Admin. Lead, Program Secretary, DDL Ops. Training Coordinator—C. Napier
BSNL Secretary—K. Thomas
Program Secretary—R. Yamamoto
Program Secretary—B. Zumwalt

Nuclear Science
Associate Division Leader
Howard Hall

Administrative Lead—C. Napier

DNT

Stockpile Radchem

Program Element Leader—J. Kenneally
Deputy Program Element Leader
W. Parker
Secretary
R. Kamerdula

Y. Dardenne
W. Goishi ▲
J. Landrum ▲
R. Lougheed ▲
J. Meadows ▲
K. Moody
N. Namboodiri ▲
J. Patin PD
K. Roberts
D. Shaughnessy
D. Sisson ▲
M. Stoyer
C. Velsko
J. Wild
P. Wilk
N. Wimer
T. Wooddy

* BBRP
\# GTSI
√ BSNL
LF Lawrence Fellow
PD Postdoc
▲ Retiree/Indeterminate
† Graduate Student

02/05/04

NAI

MPC&A and S&S

Program Element Leader—W. Ruhter
Secretary
R. Yamamoto

R. Price
J. Swanson

Nuclear Border Security

Program Element Leader—B. Lanier
Secretary
R. Yamamoto

D. Archer
J. Luke
D. Manatt

E&E

Highly Enriched Uranium

Program Element Leader—D. Decman
Secretary—B. Zumwalt

D. Leich
K. Raschke
A. Ruth

SEP

CES

Program Element Leader (Acting)
R. Gaylord
Deputy Program Element Leader
T. Mitchell-Hall
Secretary—B. Zumwalt

C. Bartholdi
N. Briant
L. Brockney
M. Cox
J. Dixon
D. Ernst
T. Fone
J. Fontanilla
K. Harward
S. Letendre
K. Listiyo
D. Montero
C. Moody-Bartel
T. Prussin
R. Salgado
C. Semuas
J. Shadoin
N. Shen
D. Silberman
P. Torretto

Scientific Capabilities

Environmental Radiochemistry

Scientific Capability Leader—B. Esser
Deputy Scientific Capability Leader
A. Kersting
Secretary—R. Yamamoto

R. Bibby
W. Culham
G. Eaton
V. Genetti
E. Guthrie
L. Harris
M. Hu
B. Hudson
J. Moran
E. Ramon
T. Rose
M. Sutton
S. Szechenyi
A. Volpe
R. Williams
P. Zhao

Radiation Detection

Scientific Capability Leader—T. Wang
Administrator
B. McGurn

D. Beckedahl
L. Dauffy PD
A. Friensehner ▲
J. Lehmann #
G. Schmid
K. Vetter #

Chemical Sciences
Associate Division Leader
Alan Burnham

Administrative Lead—B. McGurn

NAI

Forensic Chemistry

Program Element Leader—J. Reynolds
Deputy Element Leader—A. Alcaraz
Secretary—B. Zumwalt

J. Bazan #
M. Chiarappa-Zucca
P. Grant
G. Klunder
C. Koester
W. Martin #
P. Nunes
S. Shields
P. Spackman
R. Whipple

Scientific Capabilities

Chemical and Isotopic Signatures

Scientific Capability Leader—I. Hutcheon
Administrator—B. McGurn

M. Kristo
D. Phinney #
J. Smith PD
P. Weber #

Nuclear Magnetic Resonance

Scientific Capability Leader—R. Maxwell
Secretary—B. Zumwalt

S. Chinn PD
J. Herberg PD
A. Paravastu †
A. Tran PD

Nanospectroscopy

Scientific Capability Leader—T. Huser
Secretary—K. Thomas

T. Esposito PD
C. Hollars √
A. Schwartzberg †
C. Talley √

Bioanalytical Chemistry
Associate Division Leader (Acting)
Al Ramponi

Administrative Lead—TBD

NAI

Aerosol Sciences

Program Element Leader—E. Gard
Secretary—E. Davis

K. Coffee PD √
G. Czerwieniec †√
D. Fergenson PD √
M. Pitesky *√
S. Russell †√
H. Tobias PD √

Biorganic Synthesis and Protein Chemistry

Scientific Capability Leader—J. Reynolds
Secretary—K. Thomas

J. Camarero LF√
B. Hart PD √
L. Hope-Weeks √
J. Perkins √

Scientific Capabilities

Computational Systems Biology

Scientific Capability Leader—A. Quong
Secretary—B. Zumwalt

A. Golumbfskie PD
L. Harris †
B. Pesavento *PD
B. Sokhansanj PD

Biomass Spectroscopy

Scientific Capability Leader—H. Benner
Secretary—K. Thomas

C. Bailey √
N. Young √
L. Zeller √

Biophysical and Interfacial Science

Scientific Capability Leader—C. Orme
Secretary—K. Thomas

A. Artyukhin †
O. Bakajin LF√
J. Bearinger
B. Cheung PD √
M. Darragh †
R. Friddle †√
D. Hertzog †√
J. Holt PD
S. Letant √
A. Malkin
J. Muyco †
A. Noy √
M. Plomp PD
R. Qiu PD√
T. Ratto PD
T. Thomas †
J. Tringe
S. Zepeda †√

See Acronyms and Abbreviations on page 39 for full spelling of terms.

Figure 24. Chemistry and Chemical Engineering Division Organization

EMC Director—R. Simpson
DoD Technologies—C. Pruneda
DoD/DOE/MOU PM—B. Watkins
ESC Leader—W. McLean
Deputy MPL NAI—N. Rosenberg
Deputy MPL E&E—R. Upadhye

Senior Scientists
J. Britten
T. Parham
C. Thorsness

Division Leader—Randall Simpson

Division Administrator—V. Eiden
Division Administration Support—D. Tanner
Associate Administrator—S. Crowder
Administrative Support—C. McLean √
Administrative Support—S. Stacy
Administrative Support, USI/CCMS/Summer Institute Support J.Reyes-Quick SLO
Resource Manager—N. Schoendienst

Deputy Division Leader, Operations—Hugh Gregg

Deputy Division Leader, Science and Technology—Patrick Allen

DNT

Energetic Materials

Program Element Leader
J. Maienschein
Associate Administrator
S. Crowder
Administrator—S. Stacy

W. Black
A. Boegel
J. Chandler
M. Coburn *
B. Cunningham
A. Fontes
J. Forbes PG
P. Gallagher
F. Garcia
R. Garza
L. Green ▲
D. Hare
P. Hsu
M. Kumpf
J. Kury ▲
L. Lauderbach
E. Lee ▲
P. Lewis
J. Molitoris
A. Nissen √
K. Pederson
B. Rambabu PG
C. Souers
R. Swansiger
T. Tran
H. Turner
P. Urtiew ▲
K. Vandersall
B. Watkins
S. Weber
R. Weese

Weapon Materials Compatibility and Aging

Program Element Leader (Acting)—B. Balazs
Deputy Program Element
B. Balazs
Administrator—C. McLean

C. Alviso
J. Caruther *
B. Cena
I. Chiu
C. Colmenares PG
C. Harvey
M. Lane
R. McKoon PG
E. Mones
G. Overturf
R. Palicka PG
M. Schildbach
H. Smith *
L. Spellman
S. Steward
A. Vance √
B. Weeks √

* Consultant
\# Foreign National
√ Flex Term
PD Postdoc
PG Participating Guest
▲ Retiree
† Indeterminate
SLO Johnson Controls

NIF

NIF Optics

Program Element Leader—P. Whitman
Deputy Program Element Leader—M. Borden
Div. Admin.—C. McLean
Program Admin.
M. Antone

L. Auyang
J. Fair
C. Hoaglan
E. Miller
W. Miller ▲
J. Peterson
D. Wruck

NIF Target Fabrication

Program Element Leader—R. Wallace (MSTD)
Administrator
C. McLean

S. Buckley
E. Fearon
S. Letts

NIF Materials

Program Element Leader—P. Hawley-Fedder
Deputy Program Element Leader—C. Choate
Div. Admin.—C. McLean
Program Admin.
A. Clasen

R.Dylla-Spears √

P. Ehrmann
J. Ertel
G. Hampton
T. Land
R. Meissner √
J. Menapace
P. Miller ▲
T. Suratwala
R. Steele
A. Winter √
F. Zaka

NAI

NAI

Program Element Leader—D. Shoemaker
Deputy Program Element Leader—R. Grimm
Administrator—C. McLean

M. Adamson PG
D. Camp
D. Jones
F. Kong
H. Mulcahy
C. Olson
M. Riley
H. Saito √
C. Stevens

Summer Students—2003

F. Gagliardi
D. Murphy
C. Young
T. Tran
K. Glaesemann
J. Zaug

Scientific Capabilities

Extreme Chemistry

Scientific Capability Leader—L. Fried
Deputy Scientific Capability Leader—R. Gee
Assoc. Admin.—S. Crowder
Administrator—S. Stacy

K. Balasubramanian
J. Bozzelli PG
J. Crowhurst PD #
H. Curran *
K. Frischknecht PG
K. Glaesemann
N. Goldman PD
A. Goncharov
M. Howard
T. Jayaweera PG
D. Majumdar PG #
R. Manaa
M. McClelland
W. Michall PG
A. Nichols
W. Pitz
E. Reed PG
C. Tarver
P. Vitello
J. Yoh √
J. Zaug

Computational Chemical Biology

Scientific Capability Leader (Acting)—L. Fried
Deputy Scientific Capability Leader—C. Mundy √
Administrator—C. McLean

I. Kuo PD
C. Melius
J. Quong √
C. Schaldach √
J. Vandersall

Advanced Material Synthesis

Scientific Capability Leader—J. Satcher
Deputy Scientific Capability Leader—P. Pagoria
Administrator—C. McLean

T. Baumann
L. Carman
B. Clapsaddle PD
P. Coronado
K. Foster
S. Gammon √
A. Gash
M. Hoffman
L. Hrubesh ▲
S. Hulsey †
R. Landingham PG
K. Langry
R. Madabhushi
A. Mitchell
J. Poco
R. Reibold
B. Sanner
R. Schmidt
T. Tillotson

See Acronyms and Abbreviations on page 39 for full spelling of terms.

Figure 25. Materials Science and Technology Division Organization

Senior Scientists, Secretaries/Administrators

Multilayer Materials—T. Barbee, K. Silva
Materials Mechanics—D. Christensen, S. Lyons
Energy Technologies—J. Cooper, S. Lyons
Materials Integration Manager,—B. Gourdin (Program Support)
Energy and Environment—D. McCright, J. Maxwell
Metallurgy—T. Nich, K. Silva
Computational Materials—B. Wolfer, C. Paulo
Nuclear Technologies—F. Wong, J. Maxwell

Division Leader—Christian Mailhiot
Deputy Division Leader, Science and Technology—Alex Hamza
Deputy Division Leader, Operations—Ken Marsh
Associate Division Leader—Kimberly Budil
Resource Manager—Craig Schoendienst
Administrator (Acting)—Jana Marden
Associate Administrator—Kathy Gonzales

Administrative Staff

Scientific Capability and Program Secretary—B. Browning
CMS Postdoctoral Program and Program Secretary—L. Jones
Program Secretary and L-TRAIN/LITE Coordinator—S. Lyons
Scientific Capability and Program Secretary—J. Maxwell
Foreign National and Foreign Travel Coordinator—M. Salas
DDLs and Program Secretary—K. Silva

Stockpile Science

DNT
Low-Energy-Density Materials Science

Plutonium Science and Technology

Program Element Leader
B. Ebbinghaus
Deputy Program Element Leader
P. Epperson
Secretary—S. Lyons

B. Chung
P. Curtis
C. Edwards
B. Gomez
L. Gray
J. Haslam
R. Howell #
J. Lawson
D. McAvoy
K. Moore
H. Olson
D. Pugh
T. Quick
A. Schwartz
M. Sharp
J. Stanford
S. Thompson
R. Torres
M. West

Deputy Program Element Leader
J. Elmer
Secretary—M. Salas

M. Gauthier
T. Palmer
R. Pong

Special Alloys and Materials Disposition

Program Element Leader—K. Dodson
Deputy Program Element Leader
J. Burch
Secretary—S. Lyons

D. Bajao
M. Blau
A. Goins
K. Grant
M. Harland
L. Hunt
R. Klatt
O. Krikorian
D. Mew
J. Schmitz
J. Silveira

Stockpile Metallurgy and Joining

Program Element Leader—G. Gallegos
Deputy Program Element Leader
L. Summers
Secretary—M. Salas

O. Cervantes
B. Choi
R. Condit #
D. Del Giudice
R. Foreman
A. Hodge PD
L. Hsiung
R. Randich
P. Sandoval
T. Shen
T. Sun

DNT/NIF
High-Energy-Density Materials Science

Dynamic Experiments

Program Element Leader—W. King
Secretary—B. Browning

J. Colvin
J. McNancy
B. Torralva

NIF Materials Integration

G. Gdowski
B. Gourdin

ICF/Weapons Physics Targets

Program Element Leader—R. Wallace
Secretary—K. Silva

C. Alford
M. Shirk

PD Postdoc
LF Lawrence Fellow
* SEGRF
# Fixed-Term Retiree
√ Graduate Student Term
SLO Supplemental Labor

Scientific Capabilities

Correlated-Electron Systems and Alloy Properties

Scientific Capability Leader—T. Felter
Secretary—B. Browning

K. Blobaum PD
D. Clatterbuck PD
L. Dinh
S. Glade PD
H. Leider #
S. McCall
W. Siekhaus
J. Tobin
T. Trelenberg PD
J. Wong

Dynamic Properties of Materials

Scientific Capability Leader—W. King
Secretary—B. Browning

M. Barney *
G. Campbell
M. Kumar
L. Nguyen
T. Nieh
B. Reed PD
A. Ziegler PD

Homeland Security

NAI

Advanced Materials and Characterization

Program Element Leader—A. Jankowski
Secretary—K. Silva

K. Bettencourt
N. Cherepy
P. Mirkarimi
C. Walton

Scientific Capabilities

Nanoscale Materials Science and Technology

Scientific Capability Leader (Acting)
A. Hamza
Secretary—K. Silva

T. Barbee
J. Biener
W. Choe PD
S. Demos
S. Kucheyev LF
R. Meulenberg PD
T. Van Buuren
T. Wiley *

Energy & Environment

E&E

Nuclear Materials Stewardship

Program Element Leader—T. Summers
Secretary—J. Maxwell

D. Day
L. DeLoach
B. El-Dasher PD
J. Estill
K. Evans
S. Gordon
J. Hayes
G. Hust
G. Ilevbare
K. King
T. Lian
A. Lingefelter #
R. Rebak
K. Staggs
S. Torres

Scientific Capabilities

Electrochemistry/ Corrosion

Scientific Capability Leader—TBD
Secretary—J. Maxwell

J. Cooper
R. Krueger
S. Lyons
D. McCright
M. Stratman
F. Wong

Cross-Cutting Scientific Capabilities

High-Performance Computational Materials Science and Chemistry

Scientific Capability Leader—V. Bulatov
Secretary—C. Paulo, L. Jones

C. Wei LF
M. Caturla
G. Gilmer
M. Hiratani PD
C. Krenn
T. Oppelstrup √
T. Okita PD
B. Sadigh
M. Surh
P. Turchi
T. Arsenlis
E. Bringa
A. Caro
L. Davila *
T. Gonis
A. Kubota
J. Sturgeon
L. Zepeda-Ruiz PD

Materials Synthesis and Nanobeam Precision Characterization

Scientific Capability Leader—A. Nelson
Deputy Scientific Capability Leader
M. Wall
Secretary—J. Maxwell

A. Bliss
Z. Dai
C. Evans
J. Ferreira
J. Go
J. Harper
V. Mason-Reed
E. Nelson PD
C. Saw
E. Sedillo
B. Vallier
J. Welch SLO
B. Westfall
K. J. Wu

See Acronyms and Abbreviations on page 39 for full spelling of terms.

Figure 26. CMS Opertations Organization

Operations Analysis Laura Dixon **Operations Administration Support** Barbara Jackson		**Operations Managers** Al Moser, Joe Carlson		**Quality Management** **Deputy Operations Manager** Jim Fischer	
Business Operations	**Site 200 Facility Operations**	**Site 300 Facility Operations**	**Information Systems Operations**	**Site 200 ES&H Support**	**Security Support**
Manager E. Waller **Resource Managers** Business Manager—E. Waller RM Team Support C. Michelsen Operations—T. Healy CBND, GTSI, BSNL—R. Martin MSTD, MCAP, IGPE C. Schoendienst CChED/Institution N. Schoendienst **Publication Application and Web Services** Supervisor—T. Healy S. Beall E. Chen * M. Davidson * S. Dougherty * M. Emig K. Rath * S. Shang * **TRRs** Supervisor—E. Waller M. McCarra * K. Boyden * M. Prusse E. Kelly * * Matrixed SLO Supplemental Labor	**AD Facility Manager, Site 200** C. Bailey Deputy AD Facility Manager R. Rocha *Administrator—P. Brooks* **FPOCs** B235, B345—F. Beckett B155—D. Higby * B232, B345, T1541, T1602, T1927, T2425, T2428, T2475—J. Morgan * **Alternate FPOCs** B232, B345—F. Beckett B151, B152, B154, T1541, T1927—D. Higby * B132N, B133, B155, T1602—B. Hernandez * B235, B241, T2425, T2428, T2475—D. Lavinsky * **Labor Services** G. Brettelle SLO R. Ramirez SLO J. Vargas SLO **Project Management** B. Pulliam D. Sprayberry * **Property** *Administrator—Y. Villa* L. Vigil-Wright SLO Excess Acquisitions—D. Quigley	**Facility Manager, Site 300** J. Scott **FPOCs** J. Scott *Administrator—R. Dominiak* **Alternate FPOCs** D. Adams W. Black * P. Gallagher * K. Morales * D. Zevely *	**Manager (Acting)** J. Carlson **Information Systems Team** Leader—S. Miner Network Manager—D. Areson * Computer Security—F. Miller **UNIX Team** C. Smith * T. Kamakea * R. Spence * T. Flickinger * **Lead Building Technicians** B151, B154, B155, T1541 K. Clendenin,* T. Hazlett,* J. Wong * B132N—D. Dugan * B235, T2475—L. Pittson, G. Williams B241, T2425, T2428—J. Dilk * **Desktop and Network Support** T. Hazlett * J. Marriott * L. Pittson * G. Williams *	**Team Leader** S. McConnell Deputy Team Leader—T. Simpson *Administrator—L.Duncan* **Team 5 Disciplines** Document Coordinator R. LoGrande Environmental Protection B. Thomson Explosives Safety—D. Hill Fire Safety—B. Thornberg **Industrial** Safety—D. Haynes, R. Epp Hygiene—R. Kelly, J. Robertson **Facility Technicians** Technical Supervisor—B. Shea Health and Safety Technicians B151–P. Kirsten, D. Rasch B132N–R. Purta B235–L. Serrato B241–R. Stoneking **Health Physics** P. Doshi L. Smith K. Dinnel-Jones **Safety Officers** B132, B133, B151, B152, B154, B345—P. Baylacq B232, B235, B241, T1541, T1602, T1927, T2425, T2428, T2475—R. Herbert B132N, B133, B151, B152, B154, B155—K. Raine	**Directorate Safety and Security Officer** J. Fischer Security Point of Contact M. Dahlstrom Double Checkers Various

See Acronyms and Abbreviations on page 39 for full spelling of terms.

Acronyms and Abbreviations

Acronyms

AA	associate in arts
AD	Associate Director
AHRD	Administration and Human Resources Directorate
ANS	applied nuclear science for human health and national security
B	Building
BBRP	Biology and Biotechnology Research Program
BES	Basic Energy Sciences
BPAC	Biophysical Analysis and Characterization (Facility)
BS	bachelor of science
BSNL	BioSecurity and Nanosciences Laboratory
CAFÉ	Cost Accounts Funding Effort
CAS	Classified Administrative Specialist
CBMX	science in support of national objectives at the intersection of chemistry, materials science, and biology
CBND	Chemical Biology and Nuclear Science Division
CCMS	Computational Chemistry and Materials Science
CChED	Chemistry and Chemical Engineering Division
CES	Chemical Environmental Services
CMS	Chemistry and Materials Science
D&D	decontamination and decommissioning
DL	Division Leader
DDL	Deputy Division Leader
DDS	Deputy Director Science
DNT	Defense and Nuclear Technologies
DoD	Department of Defense
DOE	Department of Energy
E&E	Energy and Environment
EIR	Environmental Impact Report
EMC	Energetic Materials Center
EMPC	Energetic Materials Processing Center
ERD	Exploratory Research in the Disciplines
ESC	Enhanced Surveillance Campaign
ES&H	environment, safety, and health
FIRP	Facility Infrastructure Reinvestment Program
FPOC	Facility Point of Contact
FSC	Forensic Science Center
FSP	facility safety plan
FTE	full-time equivalent
FY	fiscal year
G&A	general and administrative
GTSI	Glenn T. Seaborg Institute
HVAC	heating, ventilation, and air conditioning
HWM	hazardous waste management
ICF	Inertial Confinement Fusion
IGPE	institutional general-purpose equipment
IPA	Intergovermental Personnel Act
ISF	Isotope Sciences Facility
ISMS	Integrated Safety Management System
LDRD	Laboratory-Directed Research and Development
LFC	Laboratory Facility Charge
LLNL	Lawrence Livermore National Laboratory
LSD	Laboratory Services Directorate
LW	Laboratory-Wide Competition
MCAP	Materials Computation, Analysis, and Processing
MD	medical doctor
MDL	Materials Dynamics Laboratory
MMF	Modern Materials Facility
MPPX	materials properties and performance under extreme conditions
MOU	memorandum of understanding
MPC&A	Materials Protection, Control, and Accountability
MPL	Materials Program Leader
MS	master of science
MSTD	Materials Science and Technology Division
NAI	Nonproliferation, Arms Control, and International Security
NEPA	National Environmental Policy Act
NESHAPs	National Emission Standards for Hazardous Air Pollutants
NIF	National Ignition Facility
NMR	Nuclear Magnetic Resonance Laboratory
NNSA	National Nuclear Security Administration
NSCL	Nanoscience and Characterization Laboratory
OBES	Office of Basic Energy Sciences
OFC	organizational facility charge
OJT	on-the-job training

Contintued on page 36 ➤

Acronyms and Abbreviations
Continuted from page 35

OPC	organizational personnel charge
PAT	Physics and Advanced Technologies
PDP	Planning, Development, and Personnel Office
PhD	doctor of philosophy
PM	Project Manager
PMC	program management charge
PMCL	Precision Materials Characterization Laboratory
R&D	research and development
RCR	revitalization, consolidation, and reconfiguration
RM	Resource Management
RRP	Room Responsible Person
S&S	Safeguards and Security
S&T	science and technology
SAR	safety analysis report
SEP	Safety and Environmental Protection
SIMS	secondary-ion mass spectrometry
SEGRF	Student Employee Graduate Research Fellowship
SEP	Safety and Environmental Protection
SI	Strategic Initiative
TBD	to be determined
TRR	Technical Release Representative
UC	University of California
USI	Undergraduate Summer Institute
XCHEM	chemistry under extreme conditions and chemical engineering in support of national security programs

Abbreviations

$K	thousands of dollars
$M	millions of dollars
assoc.	associate
admin.	administrative
B132N	Building 132 North
B133	Building 133
B151	Building 151
B152	Building 152
B154	Building 154
B155	Building 155
B232	Building 232
B235	Building 235
B241	Building 241
B345	Building 345
Comp.	Computation
div.	division
Eng.	Engineering
Ops.	operations
sci.	science
T1541	Trailer 1541
T1602	Trailer 1602
T1927	Trailer 1927
T1541	Trailer 1541
T2425	Trailer 2425
T2428	Trailer 2428
T2475	Trailer 2475

Chemistry & Materials Science Directorate
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